THE MARINE REVIEW

VOL. XXXV. CLEVELAND, MARCH 7, 1907. NO. 10

## DOCKING UNDER DIFFICULTIES.

The various photos show the proceedings of docking the steamer R. L. Ireland of the Gilchrist fleet at the Superior ship yard during hard weather and under unusual conditions of ice and snow. The R. L. Ireland, a steel freighter of 4,470 tons, went ashore on Gull Island in Lake Superior during a snow storm on Dec. 7, while on her last trip up the lakes laden with coal for Duluth. After being successfully wrecked by the Reid Wrecking Co., of Sarnia, she was towed into Bayfield and made seaworthy to proceed to her destination to unload but was met by a gale and her crew was forced to abandon her off Sand Island in Lake Superior. During the process of leaving their ship for the tug Crosby in a heavy sea, one member of the crew was drowned alongside and two others severely injured when jumping onto the icy deck of the tug. When the gale had gone down the Ireland was picked up again in a sinking condition and beached on Sand Island. She was then pumped out with compressors and after several delays finally reached Duluth with shoe and rudder lost and bottom punctured in several places.

PORT BOW VIEW OF THE STEAMER R. L. IRELAND IN DOCK SHOWING ICE CONDITIONS.

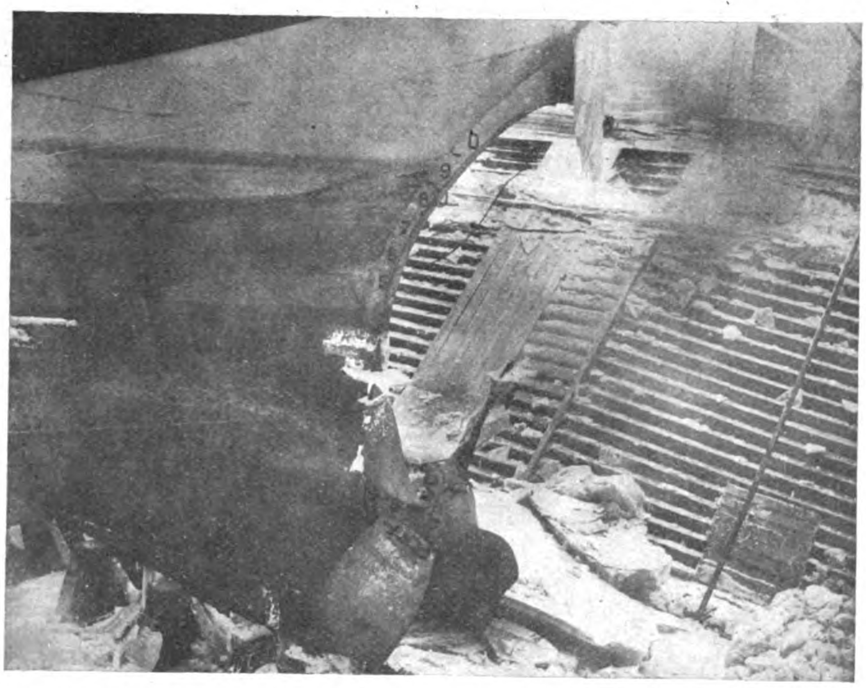
After unloading her coal she was towed through the ice in the bay to the Superior ship yard, to wait till a dry dock should become vacant. After lying there about ten days the work on the Northern Queen in dry dock No. 1 was completed and arrangements were made to float the Queen out and dock the Ireland. A large force of men was started to saw a channel in the ice. Blocks about six feet square by from three to four feet thick were sawn out and hauled onto the ice and out to the dump by wire rope lines operated by the deck engines of the ship. Thousands of tons of ice were handled thus and during most of the time occupied by these operations the thermometer stood at from ten to twenty degrees below zero and from four to six inches of new ice would form on the spaces cut for the channel. The exhaust steam from the ship yard air compressors was led to a few inches below the surface of the water immediately outside the dock gate and utilized to free that from ice and make it possible to open the gate.

After about two weeks of ice cutting and channel clearing, everything being in readiness, the dry dock was flooded; the gate opened and the Northern Queen warped out through the thin ice to a berth outside sufficiently clear of the dock mouth for the Ireland to pass in. The same day the Ireland was released from her bed of ice by the use of dynamite and also by pumping out her tanks to raise her clear of the imbedding ice by her own flotation. When darkness stopped work for that day, she was free and squared away for the dock gate. Although the following day was a Sunday, work went on without intermission, the fast-forming ice allowing no delay, and by means of warps led from her deck engines to the sides of the dry dock she was alternately hauled back and forced ahead into the dry dock, gaining about eight to ten feet ahead each trip, till when about three-quarters way over the dock sill she finally stuck and could not be moved either ahead or astern. Further ice sawing and dynamiting had to be performed, as the loose pieces of floating ice had formed into a solid mass in the nose of the dock and the ice adhering to the bottom and sides of the hull had to be cleared away to allow the after end of the vessel to pass through the gate and over the sill. A compressed air line had also to be

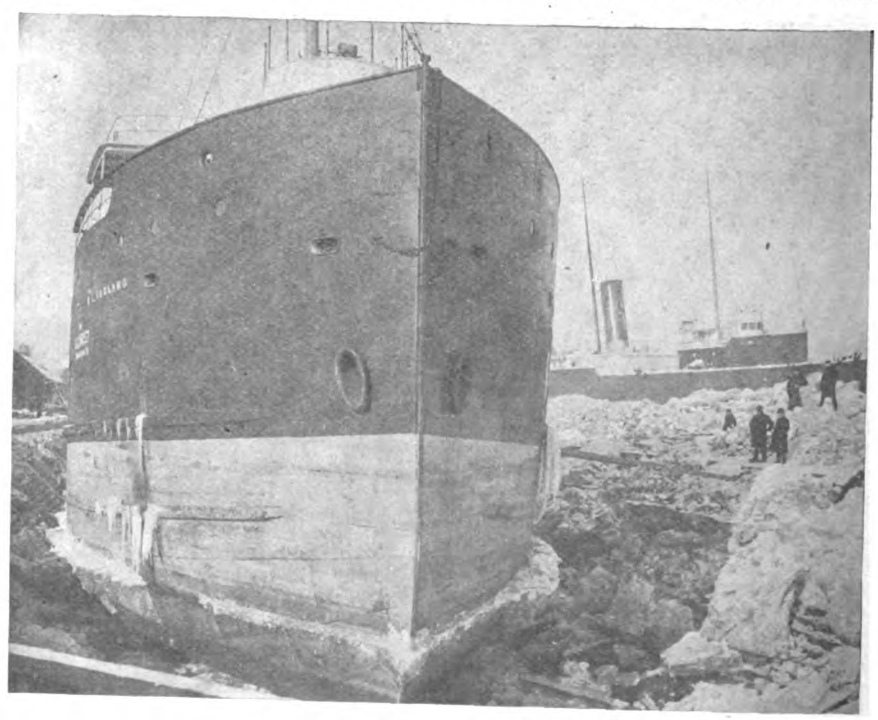
connected to the after tanks and water blown out of these to raise the stern sufficiently and allow it to clear the dock sill. An examination of the bottom was made by a diver to ascertain whether the ice on the bottom would interfere with the ship taking the keel blocks fairly, and his report being satisfactory, the vessel was hauled into position and sighted, and finally on Jan. 29 the dock was pumped out, leaving the masses of ice jammed between her sides and dock, as is shown in the photographs. This had to be removed before the work of cutting out the damaged plates and frames could be put in hand and was done partly by lifting out the blocks of ice with large ice tongs hitched up to the dock cranes and partly by breaking up the blocks with pick and crowbar into small pieces, a process rendered easy by the bitterness of the ice at such low temperatures, and piling them in a mass over the end of a pipe conducting the compressor exhaust steam, which had already done yeoman service outside the dock gate in the earlier part of the operations, and which speedily reduced the splintered ice to water, this being pumped out of the dock in the usual way.

Examination of the vessel's bottom showed that the damage, although most severe under the boiler room, extended practically her whole length, and involved the bilges as well. About 110 plates will have to be removed from the bottom and bilges and the frame damage, though in no place severe, is over a large area, and will take about two months' work in dry dock to repair. The stern post will be cut below the boss and a new bottom piece and shoe spliced in.

Considerable credit is due the superintendent and officials of the Superior Ship Building Co., for the perseverance and ingenuity they brought to bear on what was a difficult and arduous undertaking and its achievement marks what is probably a high water mark in dry docking a vessel under such severe winter conditions.



STERN VIEW OF STEAMER R. L. IRELAND IN DOCK, SHOWING RUDDER AND SHOE GONE.



THE STEAMER R. L. IRELAND IN DRY DOCK AT WEST SUPERIOR.

## VALDIVIA'S ACCIDENT.

"Thus we serve, and never swerve,
Though there's death on every side."
(The song of the marine engineer.)

The deplorable accident on the Valdivia, with its accompanying loss of life, is still another item to add to the long list of calamities coming in from the sea, a list which has a steady increase as the years pass on, and which, thanks to the misdirected energy of our newspapers, we are not allowed to bury with the past.

The engineer, periodically meeting with minor accidents in the performance of his duties, can fully realize the awful horrors of such an explosion, but why the newspaper-reading public should be treated to a detailed and most revolting account of the disaster, is certainly a matter for conjecture.

It is about time that a press censor, if such there be, closed down on the morbidly brilliant efforts of the reporter filling the columns of our daily papers, and sees to it that the more ghastly details of such accidents, at least, are omitted. That there are beings in this world of ours who gloat over such accounts, we do not doubt, but let us hope, for humanity's sake, that they represent a very small portion of the human race.

The Valdivia arrived in New York on the afternoon of Saturday February 16, with seven of the crew dead, and her upper decking wrecked amidships by the explosion of the donkey boiler. Within an hour the evening papers were vieing with one another in the descriptive account of the disaster, in several cases all sense being thrown to the wind in the en-

deavor to have as full and flowery an account as possible.

One paper, the evening "brother" of a leading morning paper, was particularly noticeable in this respect, one part of the report saying that "Although the shower of iron wrecked the chart room, destroyed the chronometer, and put the steam steering gear out of commission, Capt. Kruger was unscathed." Farther on we are told that "the captain was struck unconscious as the structure was crushed about him."

This might have passed un-noticed if our attention had not been called to the fact that "within a couple of minutes the captain, with perfect discipline, ordered the flag half masted." Of a surety, discipline would have reached its most perfect point if this were true, but when one considers the improbability of the captain thinking of such a trivial matter as half masting the flag in mid-ocean—in the midst of the confusion resulting from the explosion, too—the absurdity of this item is apparent.

In reference to the death of the fourth engineer, we read that "his body was horribly mutilated, one piece of the boiler wagon cutting his legs off as completely as could a surgeon's knife, right above his knee, while other pieces tore his body to shreds." To get at the facts of the case we wade through columns of matter like this—"The steward was cut in half at the waist," "Bodies of the men had been torn apart, and the fragments beaten down into blotches on the floor." "Men could be seen writhing in agony down in the stockehole, which had been opened up by the explosion," etc.

But the climax is reached when we read that "one of the oilers, who was killed, was impaled through the head by the piston of the donkey engine." One does not require to be an engineer to see that the reporter has overstepped the bounds of prudence in his enthusiasm, the utter impossibility of a donkey engine piston impaling any man, being very apparent.

Can it be possible that there is a demand for reading matter of this description, a demand sufficient to warrant the printing of such ghastly details?

## INSPECTING LA PROVENCE.

The Compagnie Generale Transatlantique, better known to the shipping world as the French line, entertained a large company to dinner on the evening of Feb. 26 on board their latest built express steamer La Provence at pier 42 N. R., New York. The occasion was the opening of the company's new offices at 19 State street, fronting on Battery park.

Before dinner the guests had the opportunity of looking through the first-class passenger quarters of the palatial vessel, the de luxe suites, finished in the style of Louis XVI, coming in for a large share of attention. A noticeable feature in the fittings of each suite is a private telephone for the use of the occupant, this being one of the latest innovations to add to the comfort of the voyager.

The dinner was served in the saloon of the steamer, about 300 guests enjoying the hospitality of the line. Mr. Paul Faguet, the host of the evening, in a few fitting words welcomed the guests on this occasion. He also spoke of the changes the line had made from time to time in their office quarters and service, and the good feeling existing between the republic of France and the United States. Several other speeches were made by officials and guests, and the usual toasts passed.

Owing to the absence of Capt. Alix, the commander of the Provence, who is in France on vacation, First Officer Poaret was in charge of the steamship. M. Salvey Keatley, the purser, was the official guide for the evening, being assisted in showing the visitors through the ship by the surgeon, Dr. Potel.

After dinner the guests adjourned to the various lounging and smoking rooms.

THE STEAMER R. L. IRELAND IN DRY DOCK. THE FIGURE IN THE LONG COAT IS MR. LOUIS WILLIAMS, SUPERINTENDENT OF THE YARD.

## GERMAN TEST OF TURBINES.

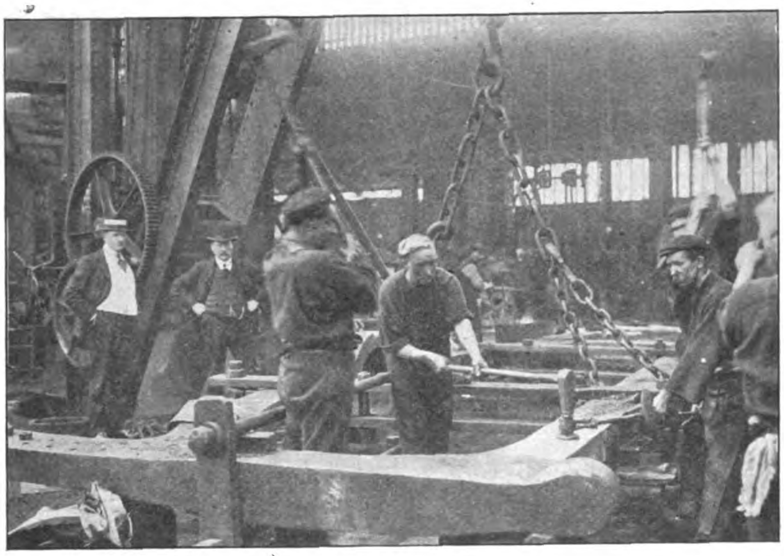
A full report has been issued of an exhaustive test of the value of turbines, compared with ordinary piston engines, in trials between the German cruisers Lubeck and Hamburg. The cruisers are similar in all respects except that the Lubeck has turbines of the familiar Parsons type. She has eight propellers mounted on four shafts. The Hamburg has old style engines.

The propellers were constantly changed, shifted and distributed in different ways so as to get the most advantageous setting. The trials were conducted in deep and shallow water, in storm and calm, first one ship leading and then taking the other's wash, and so forth.

The results briefly summarized show that in shallow water the Lubeck required 13,573 effective horsepower and the Hamburg 11,848 indicated horsepower. In deep water the figures were: For the Lubeck, 14,150, and for the Hamburg 11,582. In coal consumption also the Hamburg did the best. In actual commission the Lubeck averages 8 per cent more, with the space and weight approximately the same. In the stopping trials the ordinary engines also were better.

## ENGLAND AND ENGINE DEVELOPMENT.

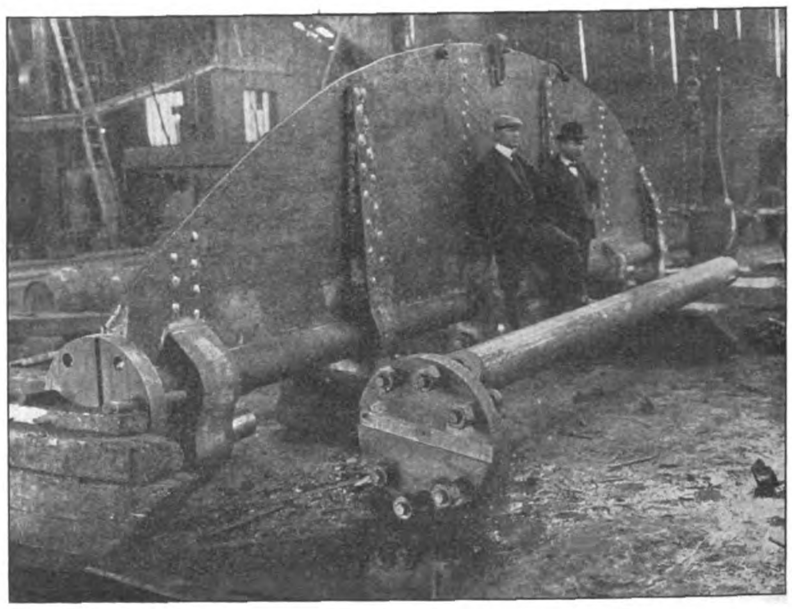
In view of the fact that England appears to be taking the lead in the development of the marine turbine, it may not be out of place to recall the fact that England has copied America far more in her types of screw engines than America has copied England. The prevailing types of screw engines first used in the mercantile marine and the navies of both countries are what are known as the "back-action," "direct-action," and the "vertical overhead cylinder" engines; and these types all originated in America. The first ship in the English navy which had her entire steam machinery below the water-line, and the first one whose engines were attached directly to the screw shaft, was the Amphion, the design of whose machinery was made in New York and sent to England.



THE SOLE PIECE WELD.

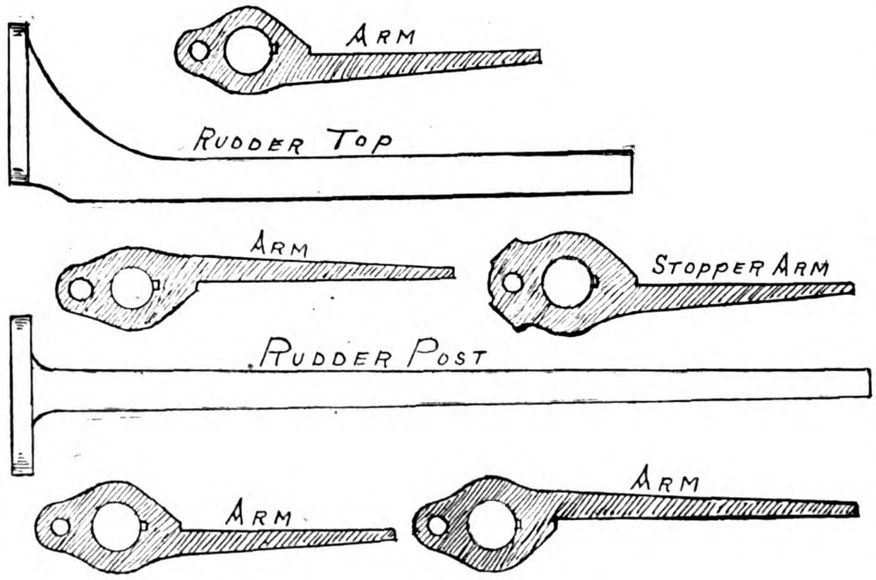
## NEW STERN FRAMES.

An invention which may possibly revolutionize the ship repairing industry at British ports may interest many readers of the MARINE REVIEW. It is an entirely new method of constructing the stern frame of a ship which has been patented by Mr. Arthur A. Fownes, managing director of the Fownes Forge & Engineering Co. Ltd., of Newcastle-on-Tyne. It need hardly be pointed out that the stern frame is a portion of a vessel's structure most liable to be damaged by wear, weather, and casualty. In the event of a vessel grounding, the strain is upon the bottom of the stern frame, and should this "give," the entire frame has to be taken out before repairs can be effected. In the event of such a mishap the time spent in dry dock is usually three or four weeks. By Mr. Fownes' novel method these repairs will occupy only as many days as previously weeks were required. Hitherto the method of building stern frames has been by the process of welding, but now Mr. Fownes throws welding to the winds, and substitutes the more rapid and more modern method of shrinking. In the A. A. Fownes patent built stern frame, the three main forgings, backpost, solepiece and bosspiece, are forged separately as hitherto, but are put together without any weld whatever. The backpost is turned in the lathe from the arch downwards, and is shrunk into the heel of the solepiece, and the gudgeons instead of being solid forgings, are portable, and are shrunk and keyed into the post in their respective positions. The bosspiece is placed in position and secured by two substantial scarph pins. The bottom of the stern frame is detachable, and in the event of damage a new bottom piece can be shrunk on to the existing frame without taking the entire frame out of the



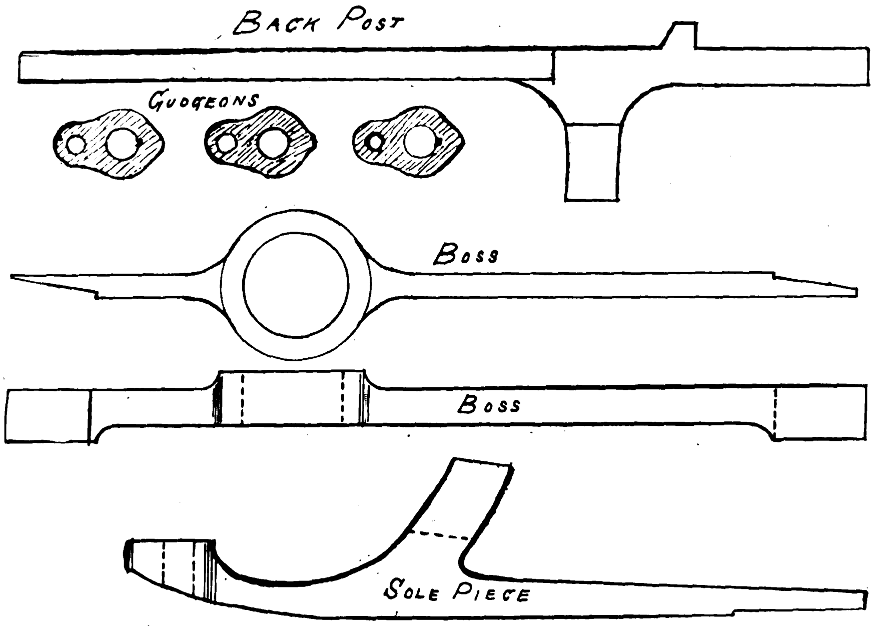
THE BUILT RUDDER.

ship, which, of course, is a matter involving great delay and expense. Should anything happen to the gudgeons, a frequent cause of casualty under the present system of construction, requiring the entire frame to be taken out—they can be treated separately by beating the old one off and shrinking the new one on. The cost of the new frame is 25 per cent greater than the cast article, but the advantages in the way of durability and detachability are so obvious that it is expected ship owners will generally insist upon the Fownes stern frame. The whole idea is to provide a sound and reliable stern frame, capable of being quickly manufactured or repaired; inasmuch as the various parts can be simultaneously concentrated on several machines prior to being finally built together for fitting into the ship. The rapidity by which this type of stern frame can be repaired is very striking and is bound to be of con-

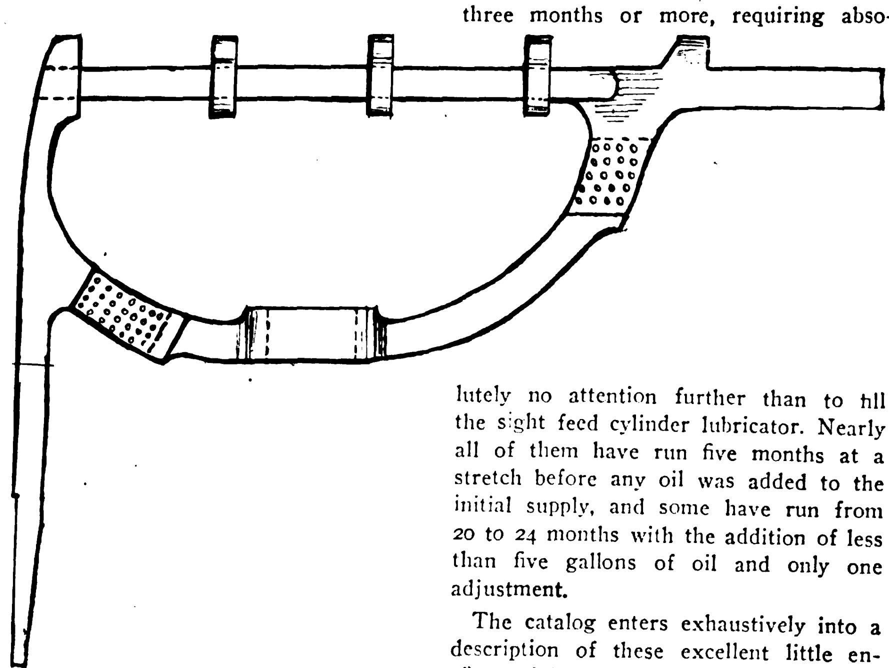



FORGINGS FOR SINGLE-PLATE BUILT RUDDER.

siderable interest to ship owners in the matter of limiting the detention of their vessel during a period of repairs. No owner would nowadays think of keeping his ship waiting, say, a month for an old-time, smith-welded rudder, whilst the single plated built type can be delivered in the space of, say, five days. Mr. Fownes' invention has been approved of by the various classification societies and by many eminent marine engineers and surveyors.




A. A. FOWNES' PATENT STERN FRAME FORGINGS.



BUILT STERN FRAME WITH ROUND BACK POST AND GUDGEONS SHRUNK ON.

## THE STETTINER MASCHINENBAU ACTIEN-GESELLSCHAFT VULCAN.

The Stettiner Maschinenbau Actien-Gesellschaft Vulcan, of Bredow, near Stettin, on the Oder, celebrated on January 29, the fiftieth anniversary of its foundation. Its ships have for some years held the Atlantic record, and for this and other services the firm has in recent years produced efficient, safe, and comfortable steamers. That it has built several notable warships is equally well known.

The Vulcan company was established under the full name which heads this article, on January 29, 1857.

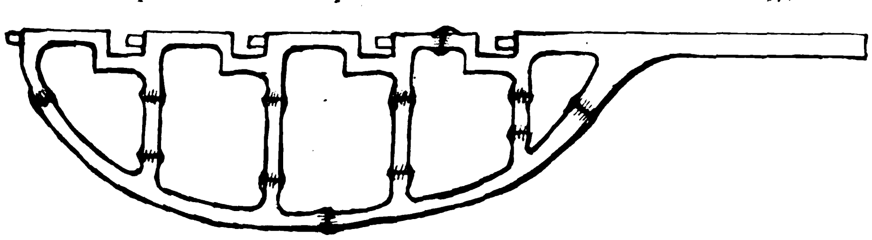
Ship building had always prospered on the bays of the Baltic, owing to the wealth of timber on the shores. But fifty years ago iron had commenced to replace wood in ship building, and later the Prussian government, after much hesitation, entrusted the firm with the order for the first turret ironclad Preussen, which was launched in 1873.

The more modern achievements of the company date from the period of the triumphant steaming of the Kaiser Wilhelm der Grosse in 1897, which crossed to New York at 21.39 knots average speed, and beat its own record in returning at 21.91 knots. The Deutschland, Kronprinz Wilhelm, and Kaiser Wilhelm II.—the sister-ship Kronprinzessin Cecilie will soon be finished—have attained average speeds of 23.58 knots. The huge yard on the Oder no longer suffices for modern requirements, and new works are now in course of erection at Hamburg. Thus the Vulcan Co. will carry on marine construction both on the Oder and on the Elbe.

## SMALL HIGH-SPEED ENGINE.

The American Blower Co., Detroit, Mich., has issued Catalog 206, devoted to vertical, self-oiling engines, which is one of the most important trade publications of the year. The company has endeavored to meet the demand for a small high-speed engine which would be equally as dependable as the best large, high-grade, automatic engines. To this end the "ABC" type A and type E vertical enclosed self-oiling engines were designed. They will run continuously three months or more, requiring absolutely no attention further than to fill the sight feed cylinder lubricator. Nearly all of them have run five months at a stretch before any oil was added to the initial supply, and some have run from 20 to 24 months with the addition of less than five gallons of oil and only one adjustment.

The catalog enters exhaustively into a description of these excellent little engines, giving wash and line drawings of all parts. Anyone interested in a small high-speed engine would do well to write for this catalog.



OLD STYLE OF WELDED RUDDER FRAME, SHOWING TWELVE WELDS.

The firm of Messrs. Fratelli Cosulich of Trieste are to establish a ship building plant at Monfalcone, Austria, the company to be capitalized at four million kronen or $800,000. There will be five berths capable of taking ships of 10,000 tons and also a dry dock.

The donkey boiler of the Hamburg-American liner Valdivia exploded recently, killing seven members of her crew and badly damaging the vessel.

## COMBUSTION IN MARINE BOILERS.*

BY PETER YOUNGSON.

Combustion, in its ordinary every day sense, is well known to engineers; but I meet men who are fairly experienced in managing engines and boilers, and yet who know little of the chemical and theoretical principles involved in the burning of coal. Heat is a form of vibratory energy, two other well-known forms being light and electricity. An engineering definition of heat is motion or energy or work. In order to estimate the quantity of heat in a body we speak of its temperature. A text-book definition of temperature is "The thermal condition of a body considered with reference to its ability to impart heat to other bodies." Our unit of heat in this country, called the British thermal unit, is the quantity of heat necessary to raise 1 lb. of water 1 degree on the Fahrenheit thermometer. Fresh water freezes at 32 degrees and boils at 212 degrees in the atmosphere on this scale.

On the Continent and in the scientific world generally the Centigrade thermometer is in common use, the freezing point of fresh water being 0 degree, and the boiling point 100 degrees. In Holland and the Dutch colonies they use the Reamur thermometer with zero for the freezing point

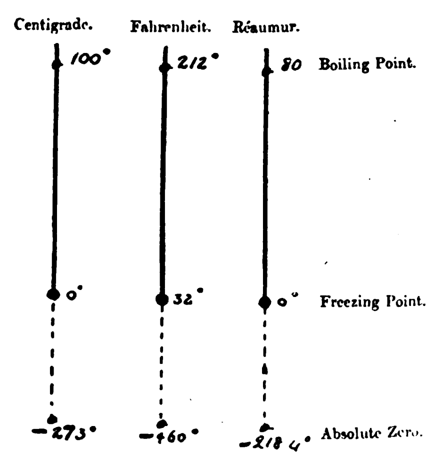



Fig. I.

and 80 degrees for boiling point of water. In lowering the temperature of a pound of water from 212 degrees F. to 32 degrees F. we take from it 180 units of heat It still contains a lot of heat at the latter temperature. The total heat in a body is calculated from the absolute zero of temperature, = —461 F. At this point, 493 degrees below the freezing point of fresh water, a body is said to contain no heat.

Dr. Joule found the mechanical equivalent of heat to be 772 ft.-lbs. per British thermal unit. Later authorities give it more:—Perry 776, Rowland 778 ft.-lbs., but in actual calculations involving these numbers, the figures are so enormous that it makes little difference to the answer, which is taken. A pound of average coal is estimated from its chemical analysis and confirmed by experiment to yield

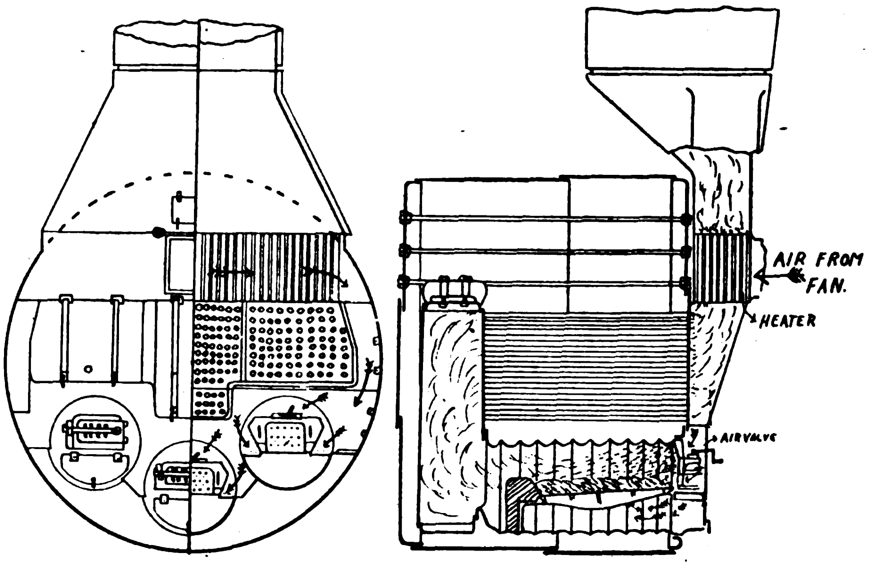



Fig. III.—Howden's Forced Draught.

14,500 B. T. U. Under ideal conditions, therefore, 1 lb. of coal is capable of doing 14,500 × 776 ft. lbs. of work. A fair result with a triple-expansion engine is 1½ lb. of coal consumed per hour per indicated horsepower. If burnt without loss and all the heat converted into work, these 1½ lbs. of coal would give:--

$$\frac{1\frac{1}{2} \times 14{,}500 \times 776}{33{,}000 \times 60} = 8.5 \text{ horsepower.}$$

This means a loss of

$$\frac{7.5}{8.5} = 8.8 \text{ per cent.}$$

This arises from the indirect method we have of utilizing the potential energy stored up in the coal. We burn it in the marine boiler furnace, making it evaporate water, and passing the steam formed through our marine engines, converting as we do so only a small fraction of the total heat of the steam into work done upon the pistons. The biggest portion of the heat, the latent heat, is given up to the circulating water, and is thus wasted. We avoid this roundabout method of getting at the power in the fuel in a gas engine or an oil motor by doing away with the boiler and burning the fuel in the cylinder itself, thus getting the full heat of combustion on the piston direct. Unfortunately the heat evolved is so terrific that we must use a water jacket to prevent the cylinder becoming red hot. Fifty per cent of the total heat is lost in this way, and thirty per cent is carried off in the exhaust, leaving twenty per cent to be converted into work done on piston. This compares favorably with the above triple-expansion engine. Coal contains 83 per cent carbon, 5 per cent hydrogen, 5 per cent oxygen, and 7 per cent of impurities, ash, etc. Combustion is the chemical action between the carbon of the coal and the oxygen of the atmosphere forming carbonic acid gas; or $CO_2$. An atom is a small portion of a simple substance. A molecule is the small portion of a compound substance. This means that one atom of carbon unites with two atoms of oxygen to form one molecule of carbonic acid gas. The burning of a pound of carbon to form $CO_2$ gives out 14,500 B.

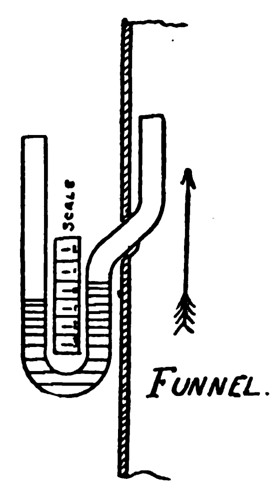



Fig. II.—Manometer.

T. U. If there is an insufficiency of oxygen, then one atom of carbon may unite with one atom of oxygen to form one molecule of carbonic oxide or CO. The heat evolved in burning 1 lb. of carbon to CO is, however, only 4,400 B. T. U. If we heat coal without giving it air to burn it, $CH_4$,

*Lecture delivered before South Shields Branch, Marine Engineers' Association.

commonly known as marsh gas, and $C_2H_4$, known as olefiant gas, will be distilled off, and the framework of carbon left behind we call coke. These gases, $CH_4$ and $C_2H_4$, represent the combustibles in a marine furnace, a gas engine, or an oil motor. The action that goes on stated chemically will be—

$$C + 2O = CO_2 \text{ or, more fully,}$$
$$CH_4 + 4O = CO_2 + 2H_2O$$
$$C_2H_4 + 6O = 2CO_2 + 2H_2O$$

The $H_2O$ in the above equation is where one atom of oxygen unites with two atoms of hydrogen to form one

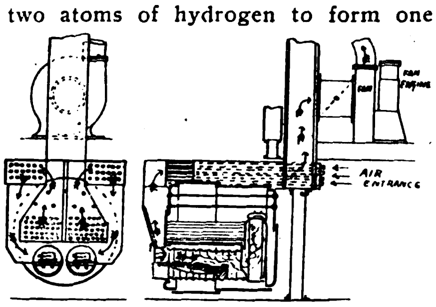



FIG. IV.

molecule of gaseous water or steam. Water, therefore. is continually being formed in the combustion of fuel. One pound of hydrogen burned to water gives out 62,000 B. T. U. The small trace of hydrogen in coal, 5 per cent, has such a big heating value that it compensates for the ash, etc., with the result that we get as much heat from a pound of coal as if it had been composed of pure carbon, viz.,—14,500 B. T. U.

Animal life is an example of combustion. During our lifetime we breathe in oxygen into our lungs to unite with the carbon in our systems and breathe out carbonic acid. The atmosphere would become contamin-

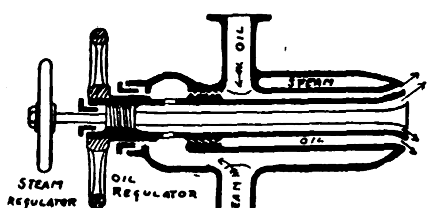



FIG. V.—Oil Sprayer for Liquid Fuel.

ated in time were it not for the fact that vegetation and plant life generally inhale $CO_2$, store the carbon in their tissues, and exhale the oxygen, thus maintaining the balance. This is the favorite theory of the formation of the coal measures. In prehistoric ages the earth's crust was hotter than it is today and conducive to the growth of dense vegetation. This decayed with time but retained its store of carbon. Earthquakes and floods are held to be responsible for sinking it to its present depth below the surface, where the internal heat and pressure of the earth slowly converted it into its present condition which we know as coal.

When any two substances combine chemically heat is evolved. Look at the simple equation $C + 2O = CO_2$. Imagine a lot of little atoms of carbon and little atoms of oxygen. If heated to a sufficiently high temperature they have an enormous affinity for each other—they rush together and combine chemically, forming $CO_2$, a gas totally different from either of the two substances that went to make it up. The actual force or friction of their impact or their collision we call the heat of combustion.

Chemistry is an exact science. In the above equation an exact amount of carbon unites with an exact amount of oxygen to form an exact amount of $CO_2$. As 23 per cent of the atmosphere by weight is oxygen, therefore it requires a definite weight of air to burn 1 lb. of coal. The chemist can do this with 12 lbs. of air, but in practice we allow twice this amount, or 24 lbs. of air to burn 1 lb. of coal. This weight of air takes up 300 cubic feet. The cube root of 300 is 6.7; therefore we get a clearer idea of this by saying that a cube of air, 6.7 ft. a side is allowed to burn 1 lb. of coal in a marine boiler. In coal mines, coal bunkers and oil tanks, we have accidents through the mixing of these gases, $CH_4$, $C_2H_4$, with air in the correct proportions for combustion—about 10 of air to one of gas. When a light is introduced into this mixture the gases unite chemically with a big explosion. The main product of combustion, $CO_2$, is not harmful to man so long as its proportion in the air does not become excessive, say over 25 per cent. This is the gas which accumulates in tanks, and which extinguishes a lamp lowered into it. The other product of combustion, CO, is a very poisonous gas, and is also dangerous because, when mixed with air and lit it explodes and burns to form $CO_2$, the action being $CO + O = CO_2$. We can now find the temperature of a marine furnace. For every pound of coal burnt there will be 24 lbs. of air + 1 lb. of gas from coal = 25 lbs. of gases present. The specific heat of these gases may be taken as 0.25; therefore, the rise of temperature of these gases will be:—

$$\frac{14{,}500}{25 \times 0.25} = 2{,}320 \text{ degrees Fahr.}$$

2,400 degrees F. may be taken as the temperature of a good furnace. The mixing and combustion of the gases are continued in the combustion chamber, so that the gases enter the back ends of the tubes at anything up to 2,000 degrees F., emerging from the front ends at 600 degrees F. or 700 degrees F.

Every pound of water evaporated in a marine boiler is given about 1,000 B. T. U. Every pound of coal gives out 14,500 B. T. U. A good boiler will evaporate 9 lbs. water per pound of coal. This represents 9,000 B. T. U. per pound of coal. The remainder, 14,500—9,000 = 5,500 units, being lost. If a steamer burns 20 tons of coal per day, then 20 × 25 = 500 tons gases are discharged out of the funnel per day at the high temperature of 600 degrees F., so the bulk of the above 5,500 units is easily traced to loss in the funnel, the remainder being radiation from the furnaces and boiler itself.

This high temperature of funnel is, however, necessary in order to get the draft in natural draft boilers. Professor Rankine found that the best conditions in chimney draft were attained when the temperature of the funnel compared with the outside air was in the ratio of 25 to 12.

When the outside air is 50 degrees F., and funnel is 600 degrees F., these conditions are fulfilled:—

$$\frac{600 + 461}{50 + 461} = \frac{1061}{511} = \frac{25}{12}.$$

This means that the weight of the funnel air is only half the weight of the outside air, or that every cubic foot of air supplied to the furnace occupies two cubic feet in the funnel. This difference in weight causes the hot gases in the funnel to rise very rapidly, causing a partial vacuum while the air outside rushes into the ashpit to take its place. This partial vacuum is found by a manometer or draft measurer. This consists of a U tube with a few inches of water in it. One leg is inserted in the funnel while the other leg is open to the pressure of the atmosphere. The pressure in the funnel being slightly less than atmospheric pressure, the air is partly extracted from that limb while the water is forced up three-sixteenths or five-sixteenths of an inch above normal level, the latter being the average intensity in marine boilers.

Coal in the ordinary kitchen grate burns slowly and the heat of the furnace is low. This is not because it is not getting sufficient air, but because the air supply is too great. Air is coming to the fuel in all directions and passes up the flue with the products of combustion. This surplus air, which takes no part in the chemical action of combustion mixing with the other gases, reduces the temperature of the chimney, thereby reducing the draft. But, by what is popularly

termed, putting the blazer up, the fire can be raised to incandescence. By this operation you localize the supply of air, causing it to pass up through the bars and fuel only. This greatly raises the temperature of the products of combustion, increases the velocity of the gases up the flue, giving a corresponding increase in the intensity of the draft. This is what Howden does in his system of forced draft. In this plant the ashpit is closed and the air is supplied by two valves, one at each side of the ashpit with another smaller valve delivering above the bars. Only 18 lbs. of air are used to burn 1 lb. of coal, giving a higher temperature of furnace, the theoretical rise in temperature now being:—

$$\frac{14{,}500}{(18+1) \times 0.25} = 3{,}000 \text{ degrees Fahr.}$$

Howden also recognized that the hotter the air is supplied to the furnace the greater the economy in fuel, as less heat will be used to raise the air to the temperature of the furnace. The flue gases, after emerging from the boiler tubes, escape to the funnel through a series of vertical tubes in smoke box. The air is drawn into a centrifugal pump or fan from the engine-room or cylinder tops, is driven along a trunk on the boiler top round the outside of the above-mentioned vertical tubes, to an air casing on the end plate of the boiler, from whence it passes to the distributing valves. It is in this way heated a few hundred degrees before reaching the ash pit. As previously stated, if insufficient air is supplied to a furnace as would be the case just after firing up, CO (4,400 units) is formed instead of $CO_2$ (14,500), the practical effect being that uncombined particles of carbon pass up the funnel in the form of smoke. The presence of gaseous water in the funnel from the burning of the hydrogen greatly aggravates this evil. We try to prevent this in natural draft by admitting air over the bars by small holes through the door and baffle plates to burn the CO to $CO_2$ and regain the 14,500—4,400=10,100 units lost. The small valve at the top of the furnace in Howden's system admits the air on top of the burning fuel and answers the same purpose.

The air when it leaves the fan is at a slight pressure equal to about two to three inches of water. A U tube, similar to one already described, is usually fastened to boiler bulkhead in the engine room. A small pipe connects one end direct to fan casing, the other being open. A scale graduated in inches is fixed between the two legs of the tube, enabling the engineer to read off the air pressure at a glance. A column of water 27 inches high gives a pressure of about one pound per square inch so that three inches on the gauge would mean a pressure of 3-27 = 1-9 of a pound, per square inch. A portable gauge is used to ascertain the pressure of air in the ashpit. A tap bolt is screwed out of the ashpit door. One end of the portable gauge terminates in a tapered nozzle which is inserted in the tap bolt hole and the reading taken. One inch of water or 1-27 of a pound is the usual ashpit pressure.

Forced draft gives a greater power on a smaller floor space, which is a great consideration in cargo steamers, besides making the steaming capacity of the boilers independent of weather conditions, but the wear and tear of the materials are greatly increased. The higher furnace temperature also causes a greater proportion of the solid ingredients held in solution by the boiler water to be precipitated, thus increasing the thickness of the scale on the heating surfaces.

The Ellis & Eaves system of induced draft is another successful plan for obtaining artificial draft. In this plan the products of combustion are drawn through the boiler tubes by a fan situated near the base of the funnel and delivered up the chimney at an increased velocity, causing a corresponding increase in the amount of air entering the ashpits. This air supply before coming to the furnace as in the Howden's system, is heated considerably by making it pass around a series of horizontal tubes on the boiler top containing the waste gases.

A steam jet in the funnel is another handy method of increasing the draft. Steam will issue out of such a nozzle at something over 2,000 ft. a second. Part of this enormous velocity will be imparted to the escaping gases, which will increase the vacuum in the uptake. We cannot afford the loss of fresh water that this arrangement entails in a steamer, but we use the whole of the exhaust steam for this purpose in a locomotive, the result being a terrific draft and a high rate of evaporation.

The possibilities of liquid fuel for ocean propulsion are as yet not fully developed, the difficulty being the scarcity and cost of supplies abroad. The advantages, however, are apparent. Petroleum has a calorific value of 20.000 thermal units per pound compared with 14,500 units obtainable from coal. You can put three tons of petroleum in the space occupied by two tons of coal, so collectively a ship should go twice the distance burning a ton of liquid fuel that it could with a similar weight of coal.

The usual arrangement is as follows: A coil containing steam and another coil with oil are led through the smoke box to a compound nozzle in the furnace door. The steam is superheated and the oil raised to a high temperature by this means before entering the nozzle. On issuing, the steam impinges on the oil, pulverizing it, and sprays it in very fine particles on a specially prepared bed of fire brick, which, when the furnace is in full blast, is kept at a white heat and very complete combustion is the result. The supplies of both steam and oil are of course separately adjustable. Care should be taken in lighting the fire to blow through by steam first as an accumulation of petrol gas may cause a serious explosion.

The following are average coal consumptions per hour per square foot of grate in marine practice. Natural draft 16 lbs. Forced draft 30 lbs. Belleville boiler 40 lbs. Yarrow or Babcock & Wilcox up to 60 lbs. Express boiler of the Thornycroft pattern 100 lbs. A torpedo boat burning coal at the latter rate shows by manometer a draft of six to eight inches of water. This is not surprising when we consider that every pound of coal will require say 20 lbs. of air to burn it, so the speed of the gases in the funnel must be enormous, likewise the quantity of air that must be supplied to the furnaces. Whenever a chemical action takes place, heat will be evolved. The resulting temperature is merely a question of the time taken by the action. In a gas-engine we place the fuel and air in the correct proportions for nearly perfect combustion, giving a temperature of over 3,000 degrees F. In the marine boiler the time of the chemical action is moderate, giving a temperature of over 2,000 degs. F., while, as a specimen of slow combustion, take the chemical action of the air and a piece of iron on the ground or the rusting of the iron. The chemical action takes place so slowly that the heat evolved is carried away by the surrounding air without any appreciable rise in temperature of the metal.

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As a result of the coal shortage on the Pacific coast many steamers formerly burning coal have been fitted with oil burners and the change is contemplated for many more. Among the steamers which have been converted into oil burners are the Buckman, Watson, Dolphin and Jefferson. The Puget Sound mosquito fleet has also been converted to oil fuel to about two-thirds its extent.

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The propeller Tennessee has been placed in the Providence service to succeed the unfortunate Larchmont.

# NEW DRY DOCK AT LORAIN.

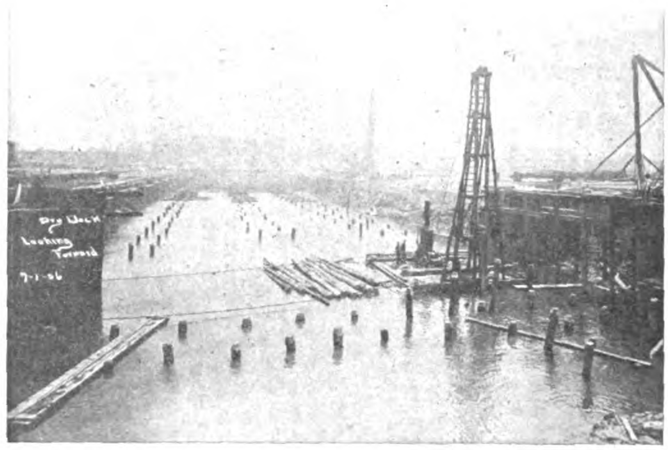
Ritchie & Ruple, consulting engineers, Cleveland, Ohio, have just completed the extensions to the Lorain ship yard of the American Ship Building Co., at Lorain, involving an expense of over half a million dollars. The original yard was started in 1897 for the Cleveland Ship Building Co., under the direction of the same engineers, and consisted of a dry dock 500 ft. long, two slips and building berths for vessels, each 500 ft. in length, machine shops, power house and joiner shop. The dry dock was lengthened to 550 ft. a few years later, and the company was merged into the present American Ship Building Co.

The extensions just completed were commenced in 1905 and consist of a dry dock 700 ft. long on the keel blocks and 764 ft. long over all, 125 ft. wide at the coping and 85 ft. at the floor; a machine or punch shop 220 ft. by 245 ft.; a power house 150 ft. by 38 ft. and two berths for building ships, each capable of building a vessel 650 ft. long.

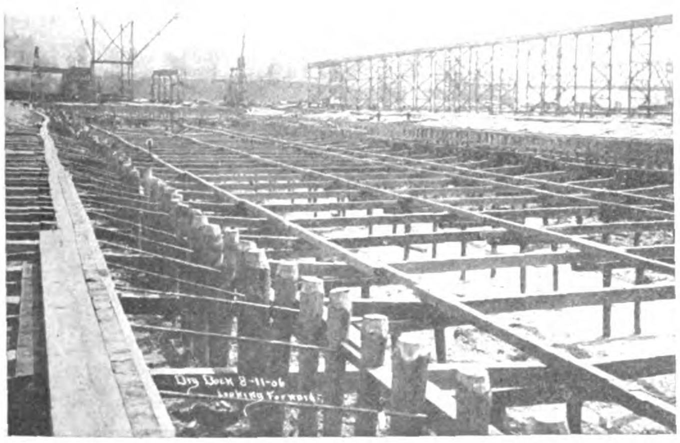
Further additions are contemplated and several changes in the arrangement of the old part of the yard, so as to provide eventually for the construction at one time of four ships of the maximum length. It is also proposed to build an engine and boiler shop and foundry in the near future.

The new dry dock is so constructed that one of the new building berths lies on each side of the dock basin, and the ships will be launched into the dry dock. The basin is built of timber supported on piling, and has a concrete apron and abutments for holding the gate. The construction is shown by the accompanying plans, sections and cuts, the latter being reproduced from photographs taken during the progress of the work. The piling, coping and planking of the basin are of oak, and all the other timber is of Oregon fir. The piles are capped longitudinally of the dock with 12 in. by 12 in. timbers drift bolted to the piles. On top of these across the bottom are placed transverse timbers, 14 in. by 18 in., bolted to the caps and spaced 8 ft. apart on centers. The main slope timbers are 12 in. by 14 in. bolted to the caps of the slope piles and framed into the ends of the transverse timbers. There is an interme-

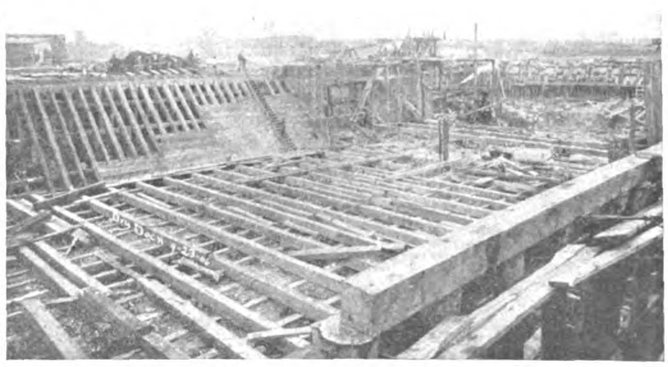
THE SITE OF THE NEW DRY DOCK. THE NEW DOCK RUNS DIAGONALLY THROUGH THIS BUILDING BERTH.



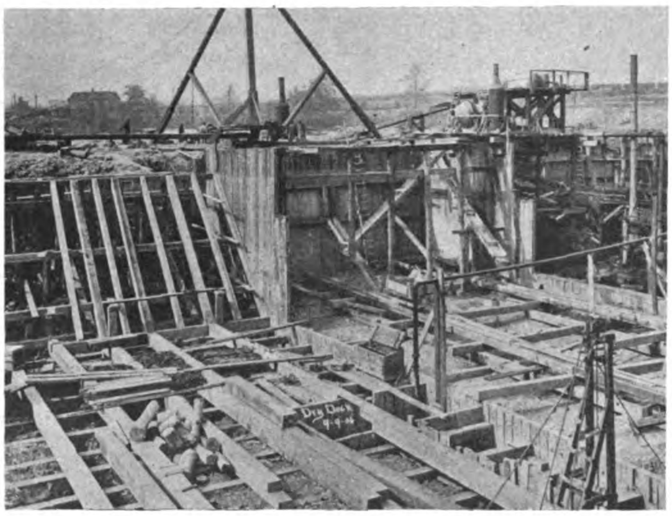
SHOWING TEMPORARY PILING.



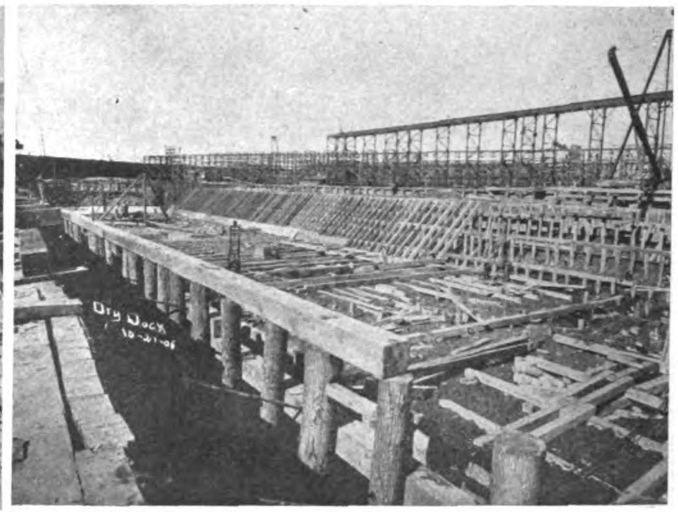
A GENERAL VIEW OF THE TEMPORARY BRACING LOOKING FORWARD.



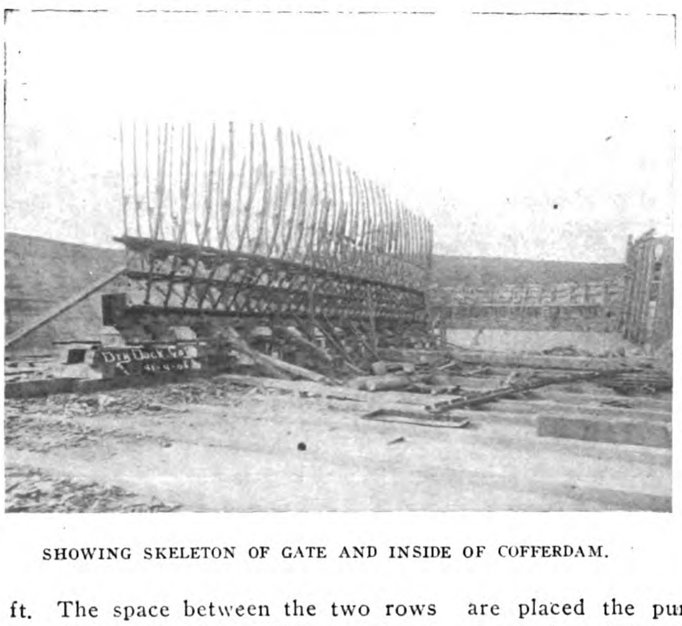
THE DRY DOCK UNDER CONSTRUCTION, LOOKING SOUTH.



SHOWING CONSTRUCTION OF APRON.



SHOWING CONSTRUCTION LOOKING NORTH.



SHOWING SKELETON OF GATE AND INSIDE OF COFFERDAM.

SHOWING GATE IN POSITION.

diate slope timber, 8 in. by 14 in., framed into a 12 in. by 18 in. filler between the bottom timbers, and also bolted to the caps of the slope piles. An intermediate transverse timber 14 in. by 18 in., 14 ft. long is placed in the center of the dock, to be used for additional support of the keel whenever it is necessary to shift the keel blocks.

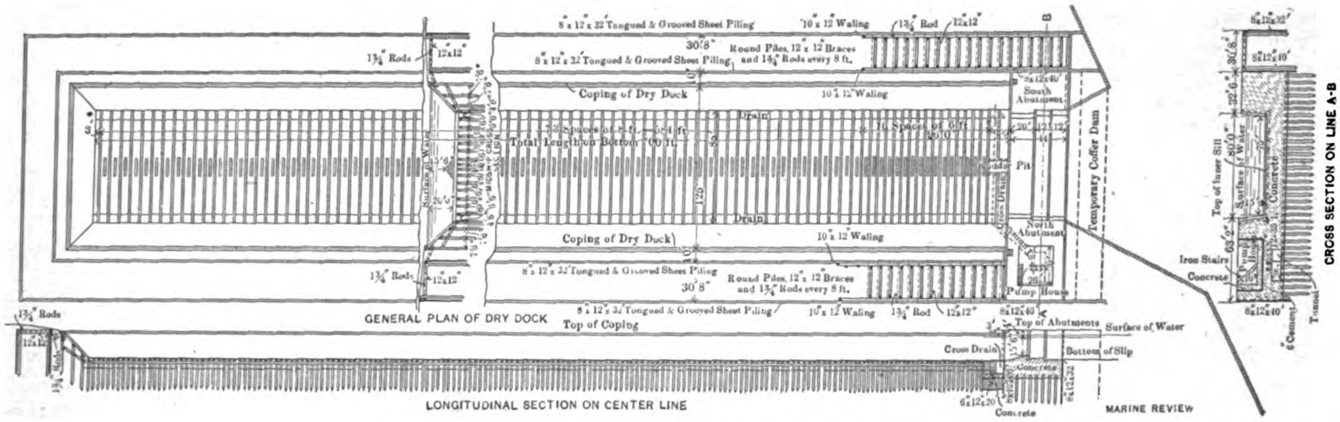
The dry dock was built diagonally across one of the old launching slips and required an extra strong protection and coffer dam. This was constructed of two rows of 8 in. by 12 in. tongued and grooved sheet piling, which entirely surrounded the work and was braced by 12 in. by 12 in. timbers and 1¾ in. steel rods every 8 ft. The space between the two rows was filled with clay. This protection yielded to the pressure in several places and it was found necessary to drive temporary piling across the dock and brace the sheeting from side to side at intervals of 20 ft. for the whole length of the dock. These braces were taken out as the permanent work reached them.

The floor and slopes are planked with 4-in. oak plank and the space between the plank and the original ground is filled with puddled clay. The coping consists of two 12 in. by 12 in. oak timbers, bolted to each other and to the upper cap of the slope piles.

The entrance apron and abutments are of Portland cement concrete with oak sills and jambs to receive the gate. In the north abutment is situated the pump house, 20 ft. by 30 ft. and 18 ft. deep, the floor of same being 10 ft. above the floor of the dock. In this are placed the pumps for emptying the dock and for drainage. There are two 36 in. and one 12 in. centrifugal pumps, the suction pipes of which extend through the floor of the pump house to a tunnel leading to the basin. These pumps are operated by electric motors placed in a house on top of the abutment, and discharge into the river just outside of the gate.

The gate is a steel caisson and is shown in the process of construction in the cuts. It was built in the dry dock basin and moved into position at the entrance, and was then tested by letting water through a sluice in the cofferdam until it had reached the level of the water in the river. As soon as it was found that the gate was tight, the work of taking out the cofferdam was commenced and is now nearly completed. It is expected that the dock will first be used to launch the new 605-ft. vessel now being constructed on the berth south of the basin, after which it will be occupied in repairs to two boats of the same size successively.

Work was commenced on the protection of the dry dock in October, 1905, and the gate was placed in posi-




GENERAL PLAN AND SECTION OF NEW DRY DOCK AT LORAIN.

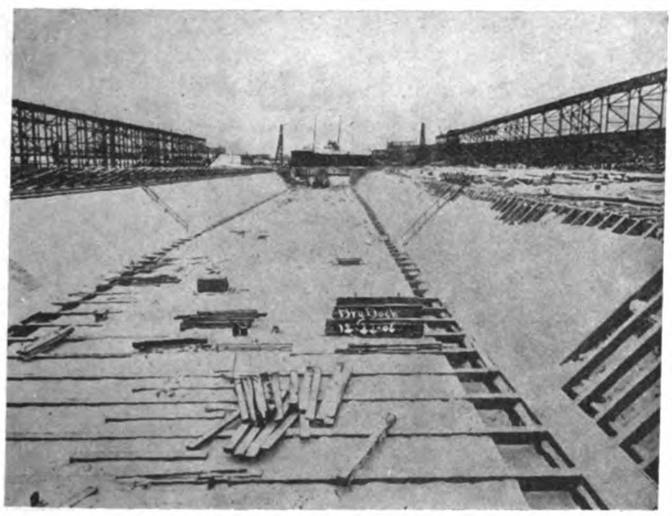
tion and tested in January, 1907, the entire time of construction being sixteen months.

The machine shop is of steel construction and has a second story over a part of same, forming a mold loft 65 ft. by 245 ft. It is equipped with a complete new outfit of tools operated by electric motors, and six traveling cranes, which convey material from the stock piles to the tools and thence to ship yard cranes. Each tool is served by a jib crane with a compressed air hoist for handling material.

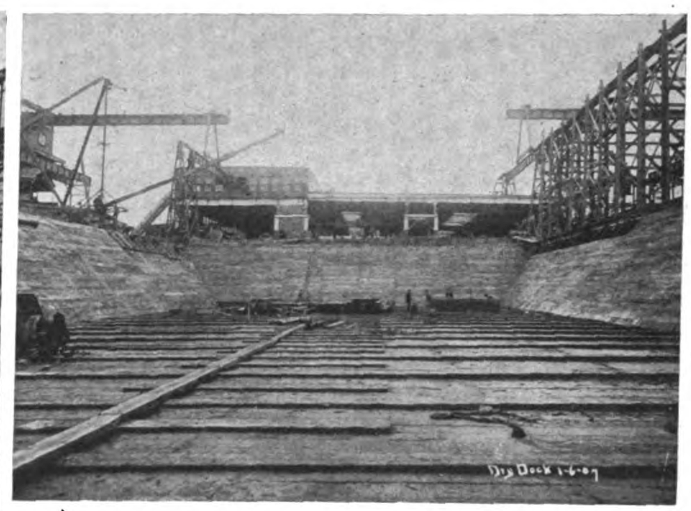
The power house is of brick with a brick stack 125 ft. high, and contains four electric generators and three air compressors operated by steam engines. The boilers are eight in number all equipped with Murphy furnaces and stokers. The old power house adjoins the new one and contains part of the above machinery and in addition the pumps for operating the old dry dock.

The new yard necessitated the construction of a protection bulkhead 1,600 ft. long at the river front, and also a new shear leg derrick of 60 tons capacity for handling engines and boilers and placing them in the vessels.

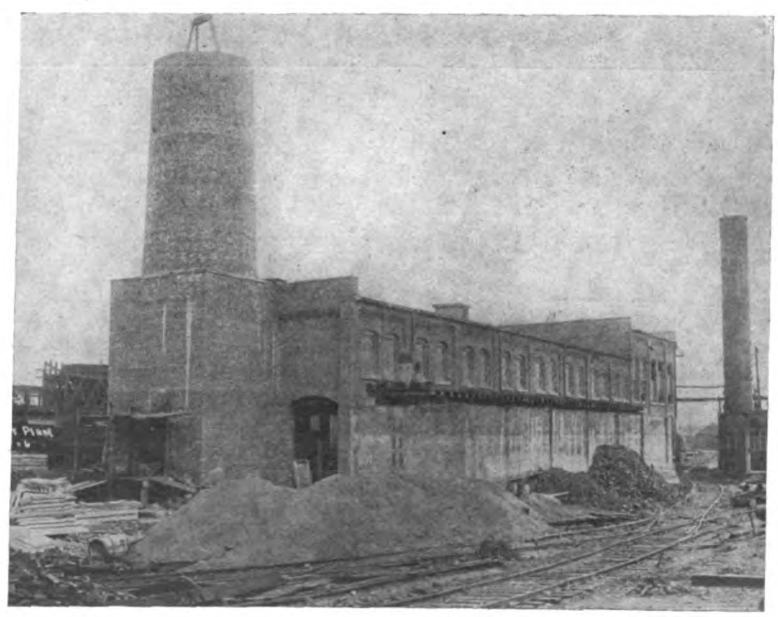
Over each ship building berth is a traveling crane of 10 tons capacity running upon a steel trestle on one side and a timber trestle on the other, the timber trestle being removable, so that it can be taken down for the launching of vessels.



LOOKING TOWARD THE GATE.



THE NEW DRY DOCK LOOKING FORWARD.

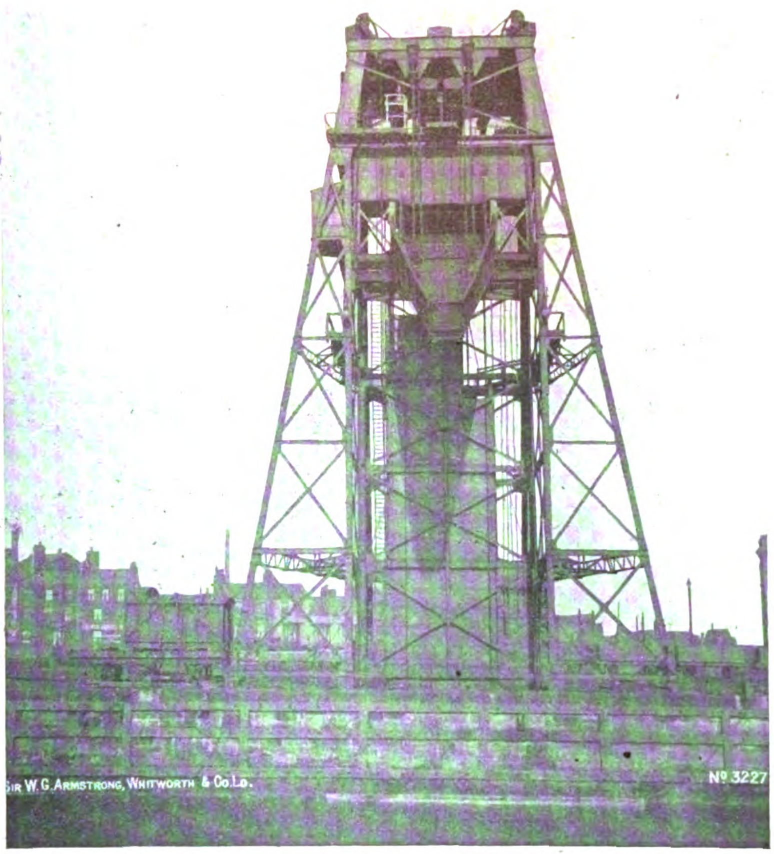


NEW POWER HOUSE AT LORAIN SHIP YARD.

The following contractors have been employed upon these works: Dry dock and river front protection, the Barnett & Record Co., Minneapolis; machine shop and crane trestles, the American Bridge Co., New York; power house and stack, the Griese & Walker Co., Cleveland; dry dock pumps, the Morris Machine Works, Baldwinsville, N. Y.; traveling cranes (outside), the Wellman-Seaver-Morgan Co., Cleveland; traveling cranes (inside), the American Machine & Mfg. Co., Cleveland; engines and generators, the Atlas Engine Works, Indianapolis. The air compressors, boilers, dry dock gate and shear leg derrick were built by the American Ship Building Co. at its own works.

## 40-TON COAL HOIST AT MIDDLESBROUGH DOCKS.

A new 40-ton hydraulic coal hoist is just now being erected at the North Eastern Railway's new docks at Middlesborough, Britain. It has been built by Sir W. S. Armstrong Whitworth & Co. Ltd., of Newcastle-on-Tyne, to the designs and specifications of Mr. T. M. Newell, of Hull, the chief engineer for the docks of the North Eastern Railway Co. It consists of a cradle 28 ft. 9 in. by 19 ft., moving in a massive steel framing, and having a range lift of 85 ft. The hopper is lifted by four wire ropes attached to the corners, carried over conveyance sheaves on the top of the framing to two hydraulic cylinders with rams working downward, placed on the back of the framing. The rams have been made solid, so that they may counterweight the cradle. The front of the framing is fitted with a shoot, which can be adjusted and fixed at any height required up to the maximum height of 55 ft. above the water. The movement of the heel and point of the shoot is effected by separate cylinders and rams, placed vertically on the back of the framing, the cylinder for the point of the shoot being of sufficient power to raise it when full of coal. The cradle has built into it a large hopper capable of holding 40 tons of coal, and fitted with a door on the dock side which permits of the coal running out of the hopper into the shoot when the hopper has been lifted to the necessary height. The cradle when down stands in a deep pit in the quay. In working, the wagons are run on to it and their bottom doors opened. After the wagons have been thus emptied of their contents, and their doors have been closed again, the trucks are run off the cradle and hoppers are then raised to the necessary height for the shoot, which is, of course, adjusted so as to suit the particular type of vessel alongside. The door on the front of the hopper is then opened, and the coal allowed to flow into the shoot, and thence into the vessel, the rate of progress being controlled by the door at the point of the shoot. It is of interest to note that the latter is sufficiently large to take a full hopper of coal. When the hopper has been emptied and its door closed, it is lowered to the quay to be again filled. All the motions of the hoist are controlled either from the cradle itself, or from an elevated working cabin on the framing, the first mentioned method being the one which is preferred in actual working. The hoist accommodates with equal facility wagons of 10, 20, or any other carrying capacity up to 40 tons, without any loss of power. When fully loaded, the hoist makes the lift of 85 ft. in one minute, and it has been ascertained that in favorable circumstances considerably more than 400 tons of coal can be shipped in an hour.



THE NEW 40-TON HYDRAULIC COAL HOIST AT MIDDLESBROUGH DOCKS.

## MOTOR BOAT SHOW.

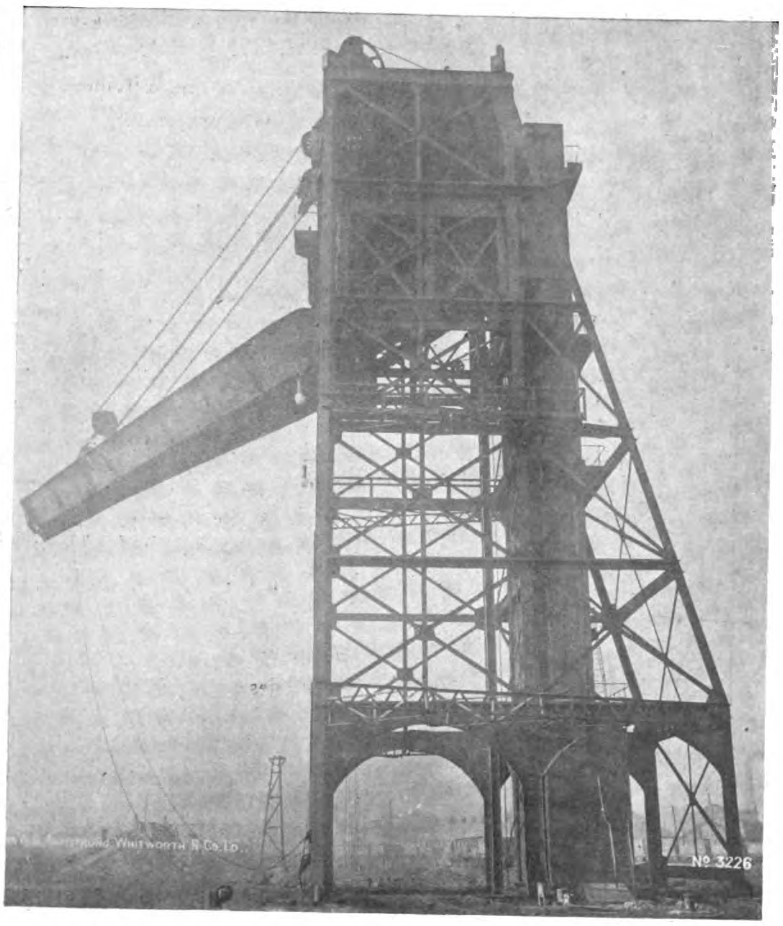
Thanks to some one's bright thought, we have yearly had a Sportsman's Show, and quite incidentally, as an afterthought, so to say, a few motor boats appeared on exhibition at the same time.

This year—from Feb. 19 to Feb. 26, to be exact—the National Association of Engine and Boat Builders had their Motor Boat Show; a show exclusively for motor boats and their accessories. Now, in Madison Square Garden, which, by the way, is not a garden, nor is it in Madison Square, there have been horse shows at which the horse was of only secondary consideration. Also, many of us visited that place during a dog show at which only show dogs were on exhibition. But from Feb. 19 to Feb. 26, Madison Square Garden was given over to a Motor Boat Show at which something better than mere show motor boats were on view. Of course, in the daily papers one could read descriptions of luxuriously furnished toys, carrying wicker chairs, brass fittings, watertight compartments, and costing $10,000.

This is all very readable, but the traditional horny-handed son of toil having $10,000 in his jeans with which to purchase a yacht is in the minority among the visitors.

Such a man summons a yacht designer to his hovel, and, nonchalantly displaying his roll, says: "Show me some of your samples."

No, not the proof that a wealthy man may get almost anything he thinks he wants, but the demonstration that a comparatively poor individual can procure the motor boat he needs must have impressed thousands of visitors on this occasion. Take, for instance, the power




VIEW SHOWING CRADLE RAISED TO LEVEL OF SHOOT.

dories exhibited by some New England company. A 16-ft. dory, equipped with one of the most compact engines seen in these parts, could be had for $225.

The only simon-pure novelty was the 5-cylinder, self-starting motor. An engine fitted with five cranks can be so accurately balanced as to entirely eliminate a dead center, while one of the five cylinders is always ready to take the charge.

Then, gasoline is no longer at the head of the procession, denatured alcohol, kerosene and electricity proving worthy competitors for the post of honor. From this and the above mentioned fact of the price of a really serviceable power boat being now within the means of the many, one may safely predict that next season the motor boats will be conspicuous by their multitudinous presence.

## FINEST AMERICAN OIL CARRYING VESSEL.

Recently the largest, best constructed and most handsomely equipped oil-tank steamer that flies the American flag on either ocean reached the port of San Francisco. She is named the W. S. Porter and was built at Newport News for the Associated Oil Co., whose property she is. She will carry crude petroleum from the Coaliuga and Santa Maria oil fields to supply San Francisco, Portland and other Pacific coast ports, southeastern Alaska, Douglas Island and the Hawaiian Islands. She is 3,000 H. P. and has a gross tonnage of 5,000. She is fitted with twelve tanks having a total capacity of 55,000 barrels of oil and with two pumps that can empty or fill her tanks at the rate of 7,000 barrels per hour. The quarters for her officers and crew are as large and comfortable as are to be found on an ocean liner. Her maiden trip from New York to San Francisco through the Straits of Magellan, with the tug Navigator in tow, took her sixty-one days, one night being passed in the Straits.

The Navigator is the handsomest tug boat, with the exception of the United States army transport tug Slocum, that has ever been seen in the bay of San Francisco. She was chosen on account of her speed by the New York Yacht Club for the conveyance of the judges at the international races for the America's cup. She will be employed by the Associated Oil Co. in towing oil barges to the ports on the Pacific coast and the Hawaiian Islands. The two craft are notable additions to the fleet of vessels that call San Francisco their home port.

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The United States army transport Sheridan may be repaired at a San Francisco ship yard if the Mare Island navy yard authorities find it impossible to spare a dry dock for her.


VIEW SHOWING CAR ABOUT TO BE RAISED.

THE MARINE REVIEW

DEVOTED TO EVERYTHING AND EVERY INTEREST CONNECTED OR ASSOCIATED WITH MARINE MATTERS ON THE FACE OF THE EARTH.

Published every Thursday by

The Penton Publishing Co.

CLEVELAND.

BUFFALO ................. 932 Ellicott Sq.
CHICAGO ............ 1362 Monadnock Blk.
CINCINNATI ....... 124 Government Place.
NEW YORK ................ 150 Nassau St.
PITTSBURG ............... 521 Park Bldg.
DULUTH.

*Correspondence on Marine Engineering, Ship Building and Shipping Subjects Solicited.*

Subscription, $3.00 per annum. To Foreign Countries, $4.50.
Subscribers can have addresses changed at will.

Change of advertising copy must reach this office on Thursday preceding date of publication.

The Cleveland News Co. will supply the trade with the MARINE REVIEW through the regular channels of the American News Co.

European Agents, The International News Company, Breams Building, Chancery Lane, London, E. C. England.

Entered at the Post Office at Cleveland, Ohio, as Second Class Matter.

March 7, 1907.

## SHIPPING'S VIRTUAL VICTORY.

To prevent the enactment of the shipping bill during the last congress it required that the opposition should sink so low in public estimation as to filibuster. Filibustering is a practice more honored in the breach than the observance. There is very little that can be decently said of a man who will take advantage of this legislative bulwark to arrest the will of the people. It isn't fighting fair, which is sufficient to condemn it as a practice in the judgment of nine thousand nine hundred and ninety-nine. Then the ten-thousandth man appears to fret his little hour upon the stage. He is the legislative spear carrier. This nation never intended that the rule forbidding limitation of debate upon any measure in the United States senate should be exercised in the closing moments of a session against a measure which had been carefully debated in all its phases and which had previously passed both houses. The rule is a wise one. It has frequently prevented the enactment of hasty and immature legislation, but its exercise for the sole purpose of defeating the express and deliberate will of the people is an insolent perversion of its uses. The exhibition which Senator Carmack and his few associates made of themselves was disgraceful. It was a grown man merely making a noise, an adult playing with a rattle, and this in the most dignified legislative chamber on earth.

The shipping bill is not law, but its advocates won a victory nevertheless. They passed a measure through both houses, the Gallinger bill in the United States senate, and the Littauer bill in the house of representatives. The Gallinger bill was drawn as a result of the investigations made by the Merchant Marine Commission throughout the United States during the summer and fall of 1904 under the leadership of Senator Gallinger. It was both comprehensive and moderate. It extended mail lines to a number of points not now reached; it provided a reasonable subsidy for freight carriers; and it created an adequate naval reserve—all this without taking a single penny from the United States treasury, as the revenue-producing feature of the bill alone would have met all expenditures that the bill authorized.

The Littauer bill struck out the subsidy provision for cargo carriers, but authorized the establishment of four new mail routes with the proviso that no steamships now in existence could take part in the service. It also provided for the creation of a competent naval reserve and was self-supporting through its revenue-producing features. The senate was willing to accept the Littauer bill, but the filibusters would not permit a vote upon it. They talked it to death. This seems to us a shameful thing to do. Had the measure been iniquitous, or revolutionary, or a compromise of our liberties, any means of killing it would have been justified, but as it was merely intended to extend trade, and as opposition, at the most, could mean no more than a mere difference of opinion it was moral, if not legal, transgression of authority to filibuster against it.

Moderate as the Littauer bill was, it would have built 20 ships at a cost, in round numbers, of $20,000,000. Of this sum $18,000,000 would have gone into the pockets of the laboring men. It would have done almost as much for our internal commerce as it was intended that it should do for our foreign commerce. It would have quickened industry from the mines of Lake Superior to the ship yards of both coasts, stimulating the thousand and one enterprises that are tributary to the building of a great ship.

What is this question of the American Merchant Marine if it is not one of American labor, of national pride and of common defense? The ship may seem an alien thing to a great many, but it is nevertheless as necessary as the railroad. The railroad makes the nation cohesive. It is the greatest defender we have, for we can mobilize products and men anywhere within a few hours; but the ship makes us international and is the only agency we possess to enforce our just rights or to resist unjust demands abroad. Without ships, notwithstanding our vast domain, we are insular, and our authority ceases at the coast. We have colonial possessions, but we could not really defend them if they needed our defense. The United States is so big, so aloof from invasion, that we lull ourselves into a sense of seeming security; yet today we could not hold the Philippines if Japan should want them. We may as well look facts in the face. We are the possessors of colonies; we ought to be able to hold them whether we want them or not. We are a maritime nation; we ought to have ships.

Possibly the action of the filibusters will arouse the public conscience. We will have ships and men to man them as soon as the people can be made to understand. They are beginning to understand in considerable numbers already. Certainly a sufficient number were interested to elect a congress that passed a shipping bill. During the past two years a wonderful campaign of education has been going on in all parts of the country. Hundreds of boards of trade and commercial bodies, hundreds of schools and colleges and thousands of labor unions have discussed the subject,

and petitions and resolutions have been sent to Washington from all quarters urging the enactment of a shipping measure. This campaign will not cease, but rather will go on with increasing energy, for there is no question comparable with it in importance before the people today. It is America's greatest unadjusted question, affecting the continued progress of every industrial establishment, touching the well-being of every citizen and embracing the common interest we all have in the defense of our rights as a nation.

President Roosevelt understands this, for he made it the subject of a special message. Speaker Cannon understands it, for he left his chair to vote for it. The most enlightened element in the last congress understood it, for they spoke long and earnestly for it. Indeed, if anyone is uninformed upon this subject let him examine the speeches of the last three weeks. The speeches of the advocates were eloquent documents from real life, illustrated with practical examples that are to be met with every day in the commercial strife of the nation. The opponents of the bill derived their examples from books and quoted Adam Smith, who has been peacefully sleeping these hundred and twenty-five years. On one side are practical men dealing with a condition; on the other side are mere dreamers of dreams dealing with theory.

What this country needs is ships. It must have them. It can't have them without compensating for the artificial handicap imposed upon their construction and operation by the protective tariff. There is much in this question and it is worthy of the study of every American citizen.

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There will be fifty-odd excursion steamers in the Norfolk district this season, owing to the Jamestown exposition traffic, and John W. Oast, supervising inspector of steam vessels for the district, has petitioned for six additional inspectors. Among the vessels named for this traffic are the Rosedale, John Sylvester, J. S. Warden and Mount Desert.

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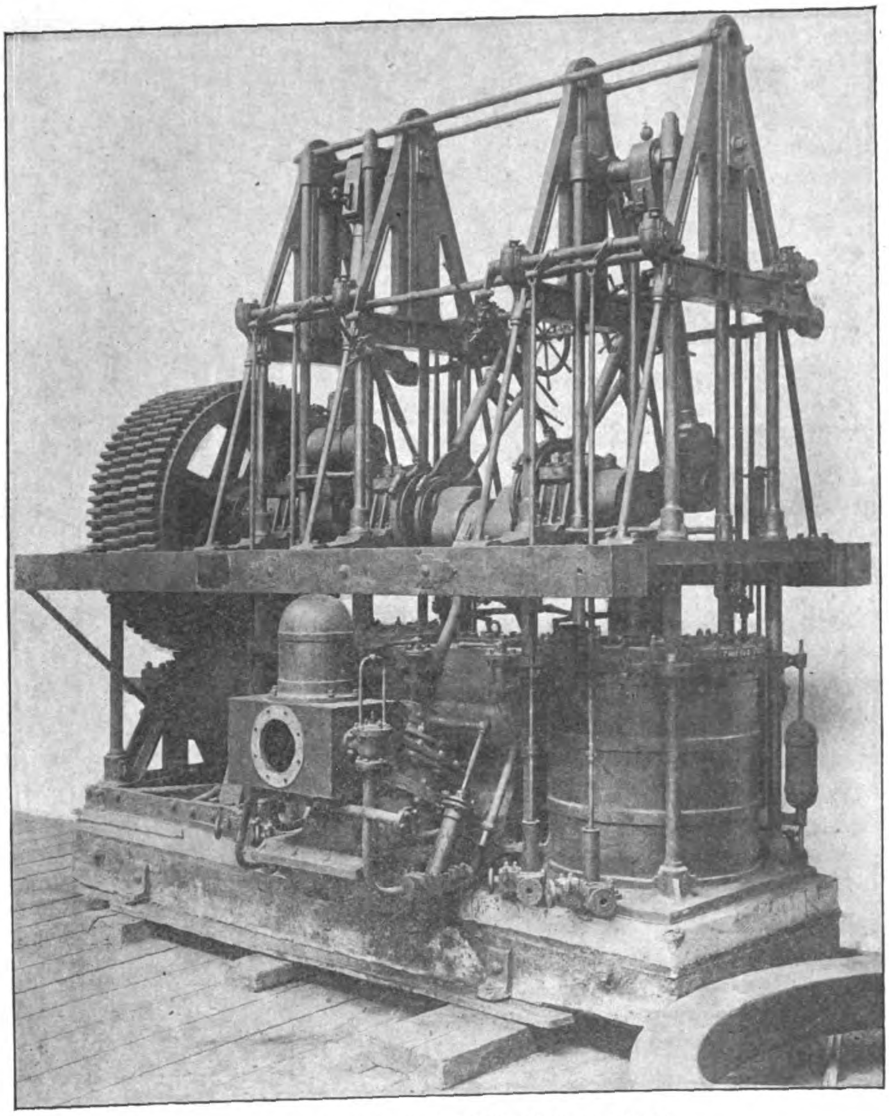
The new British steamship Tabaristan will arrive at New York from Glasgow shortly and will go into the Ward line service under the Cuban flag. The Tabaristan is 358 ft. long, 44 ft. beam, and 16 ft. deep.

## APPOINTMENTS OF MASTERS AND ENGINEERS.

| | Captain. | Engineer. |
|---|---|---|
| **THOMAS ADAMS, DETROIT, MICH.** | | |
| Str. Langham | David Wilson | Robert L. Harris |
| **ANCHOR LINE, ERIE & WESTERN TRANS. CO., BUFFALO, N. Y.** | | |
| Str. Juniata | Edward Martin | Wm. Wilson |
| " Tionesta | John Doherty | John Wise |
| " Japan | H. Cronkhite | E. Stevenson |
| " Delaware | H. O. Miller | John Jordan |
| " Muncy | Angus McKenzie | F. Rehbaum |
| " Codorus | L. Wright | Tim Griffin |
| " Mahoning | Geo. J. Delaney | W. A. Black |
| " Schuylkill | Jos. Corcoran | W. Garrity |
| " Susquehanna | Chas. Nelson | Al Edgar |
| " Lehigh | Frank Bloom | John Healy |
| " Clarion | M. Boggan | Al. Welch |
| " Alaska | J. J. Lehan | Wm. Erskine |
| " Wissahickon (building) | Chas. Christy | Not appointed |
| **J. E. BALL, BUFFALO, N. Y.** | | |
| Str. P. P. Miller | Frank Weinheimer | W. C. McDougall |
| **BARRY BROS. TRANS. CO., CHICAGO.** | | |
| Str. Pere Marquette No. 5 | Jos. Lamoreaux | Chas. Grobben |
| " Wisconsin | Thos. Barry | James Reid |
| " Empire State | | |
| **W. H. BECKER, CLEVELAND.** | | |
| Str. B. F. Jones | C. M. Ennes | Chas. V. Culver |
| " James Laughlin | Geo. A. Symes | Wm. Millington |
| " W. G. Pollock | H. G. Haybarger | Edw. Reilly |
| " J. W. Rhodes | Thos. G. Simmons | James Norton |
| " F. L. Robbins | | James Connors |
| " Francis Widlar | Henry Hinslea | Geo. Allen |
| " Edw. H. Ohl | F. B. Chilson | John Quinn |
| **BROWN STEAMSHIP CO., CLEVELAND, O.** | | |
| Str. Castalia | John F. Jones | Edw. Dempsey |
| **J. A. CALBICK CO., CHICAGO.** | | |
| Str. Jas. H. Prentice | Samuel Olsen | |
| " P. J. Ralph | John Evans | G. H. Mellon |
| " Kalkaska | Gustav Gunderson | |
| " Walter Vail | R. T. Evans | James McMillan |
| Bge. R. L. Fryer | Emil Christen | |
| " Halsted | John Lundberg | |
| " Harold | Helmer Hagenson | |
| " Connelly Bros. | Carl Johnson | |
| **CALUMET TRANS. CO., CLEVELAND, O.** | | |
| Str. Geo. A. Flagg | A. McArthur | Wm. Newcome |
| " R. S. Warner | V. L. Horner | August Romzick |
| Sch. S. D. Warriner | Geo. A. Brock | |
| " A. W. Thompson | F. C. Hart | |
| **CANADA & ATLANTIC TRANS. CO., MONTREAL, CAN.** | | |
| Str. Arthur Orr | J. Simons | John Murnan |
| " Geo. N. Orr | H. Jaenke | Thos. Kelly |
| " Kearsarge | Wm. Baxter | H. H. Evans |
| " Ottawa | A. Birnie | Wm. Paus |
| **E. D. CARTER, ERIE, PA.** | | |
| Str. J. H. Bartow | A. E. White | Wm. Taylor |
| " E. D. Carter | C. H. Wilson | W. J. Kelley |
| " Panay | C. H. Wilson Jr. | John Stevens |
| " Luzon | W. W. Wilkins | H. E. L'Hote |
| **S. P. CRANAGE, BAY CITY, MICH.** | | |
| Str. Thos. Cranage | G. A. Montgomery | Wm. Nerreter |
| " City of Paris | L. H. Powell | David N. Humphrey |
| **CROSBY TRANSPORTATION CO., MUSKEGON, MICH.** | | |
| Str. Naomi | Thos. Traill | Barney O. Hopkins |
| " Nyack | J. F. Cavanaugh | Karl Hallberg |
| " Conestoga | | Thos. Eason |
| **LOUIS F. DRIESKE, CHICAGO.** | | |
| Sch. Ford River | Peter Hansen | |
| **FRANKLIN TRANS. CO., CLEVELAND, O.** | | |
| Str. Wm. F. Fitch | B. W. Landfaer | Wm. Miller |
| Sch. A. Maitland | Wm. Langell | |
| **GRAND TRUNK MILWAUKEE CAR FERRY CO.** | | |
| Str. Grand Haven | Chas. A. Lyman | Eugene Scott |
| **JOHN GREEN, BUFFALO, N. Y.** | | |
| Str. Lewiston | Samuel Thurston | James Green |
| **CAPT. J. B. HALL, BUFFALO, N. Y.** | | |
| Str. Culligan | | Geo. M. Wise |
| **HAMILTON STEAMBOAT CO., HAMILTON, ONT.** | | |
| Str. Macassa | James Henderson | Wm. Noonan |
| " Modjeska | Patrick Walsh | Oscar Flumerfelt |

## GEARED MODEL OF ENGINES OF S. S. SIMLA.

We have been favored by Mr. G. Desvignes, of the West London Engineering Works, Gunnersburg, London, with the accompanying illustration which shows



GEARED MODEL OF ENGINE OF S. S. SIMLA.

an extremely interesting engine. It is a model constructed on a scale of 3 in. to the foot by Messrs. Tod & McGregor in the year 1853. This model which is probably the finest marine engine model ever constructed, was exhibited in the Paris Exposition Universelle in 1855, and was specially mentioned and awarded the Medaille de' Honneur by the judges. As exponents of the beginning of good mechanical work, the model is unrivaled and at the present day would be difficult to surpass.

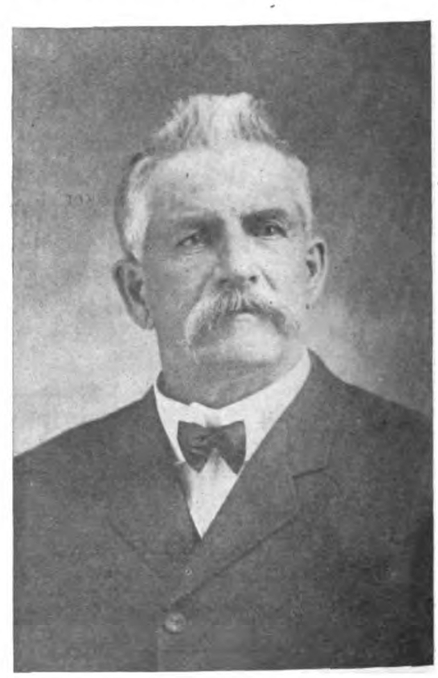
The engines are of the four piston rod steeple type, and are geared at the ratio of 2¾ to 1, the spur wheel being a mortice wheel, and the pinion being a fine piece of work. It is in four steps, and all in one exceptionally clean casting. There are four gun-metal bilge pumps with clock valves, worked from diagonal rods from the expansion eccentric straps, these pumps being constructed to throw out of gear in pairs by a very ingenious sheave on the rods which work the rocker shafts by which the pumps are driven. Between the cylinders is the hot-well on either side of which are the air pumps at an angle of 45 deg.; these are driven from the main crankshaft by connecting-rods working in trunks. There are two feed pumps of the plunger type, which are driven on either side of the starboard air pump by a crosshead affixed to the trunk.

The reversing gear is of the balanced slip sheave description, the throwing over being accomplished by a band wheel and geared quadrant for each engine separately. The expansion valves are driven by separate sheaves with throw-out lever gear, which actuates the rocker shaft. The guides are constructed in three pieces in a very ingenious manner for taking up wear. The model was exhibited in London in 1862, and found its way to the Crystal Palace. It stood for many years in the Ivory Turning Court. It was then moved upstairs, and until recently it remained neglected and covered with dust close to the engines generating the electric light for the Palace.

The model represents on a fairly large scale the very best practice of the period when it was made. It was taken as proved that the proper piston speed for a marine engine was 240 ft. per minute, and as this did not give a sufficient number of revolutions to the screw, gearing was introduced. The Simla was a P. and O. boat, one of the first in which screw propulsion was used. The nominal power of the engine was 600, but it probably worked up to about 2,500 I. H. P. This model is, as far as is known, the only one in existence of geared screw engines. It cost over $20,000. The workmanship is exceptionally fine. The present owner, Mr. G. Des Vignes, of the West London Engineering Works, found the model in a yard and put it in order. It is a matter of everlasting regret, says *Engineer*, London, if it is not bought by some science college or museum. It is impossible to get anything more typical of the current of engineering thought and practice at a time when Great Britain still led the world in mechanical art. We understand that the model is for sale, and it can be inspected by any individual or institution desiring to purchase it.

## REPAIR WORK AT KENYON'S YARD.

Wooden ship repairs must be extensive if the work which is lined up at A. P. Kenyon's Marine City ship yard is



MR. A. P. KENYON.

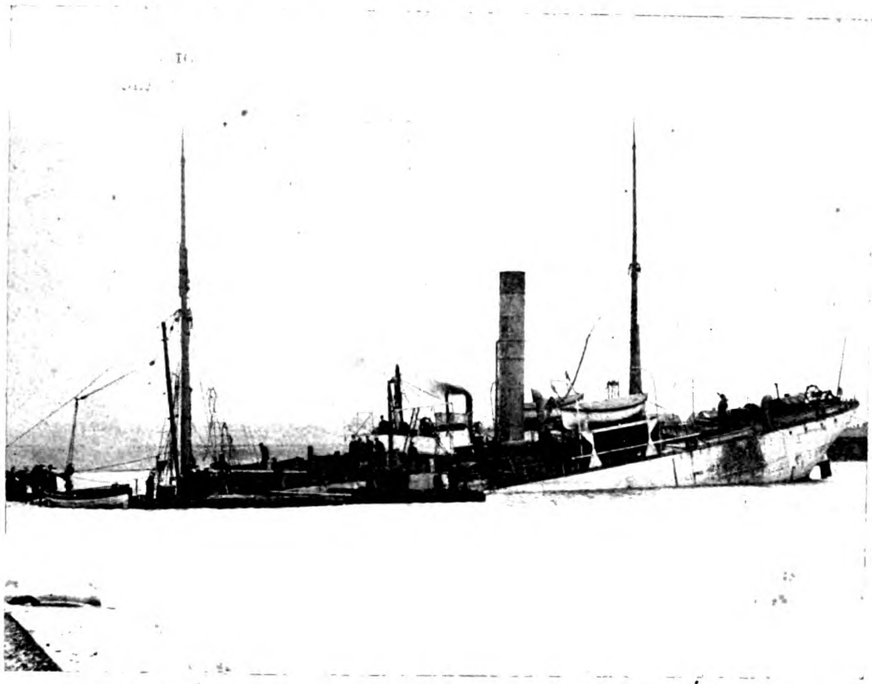
any indication. Belle River, where the plant is located, is well filled with old-time wooden boats which are waiting

their turn. Among them are the steamers George King, Oscar T. Flint, Sparta, Gogebic, Tempest, Toltec, and the barges Thomas Gawn, Biwabik, Nelson Bloom,

Spain, was waiting to get ... at Newport, Bristol Channel, on Saturday, Dec. 22 last, the steamer Don Ar-

Tom Lemon. He worked for Morey & Hill, Marine City; F. W. Wheeler, Bay City; Mason & Corning, Saginaw; Wright & Prentice, Saginaw; and old

ments in its possession bearing upon the subject which would go to show whether



SALVAGE OF S. S. DORDOGNE, SHOWING THE VESSEL SUNK IN ALEXANDRA DOCK, NEWPORT.

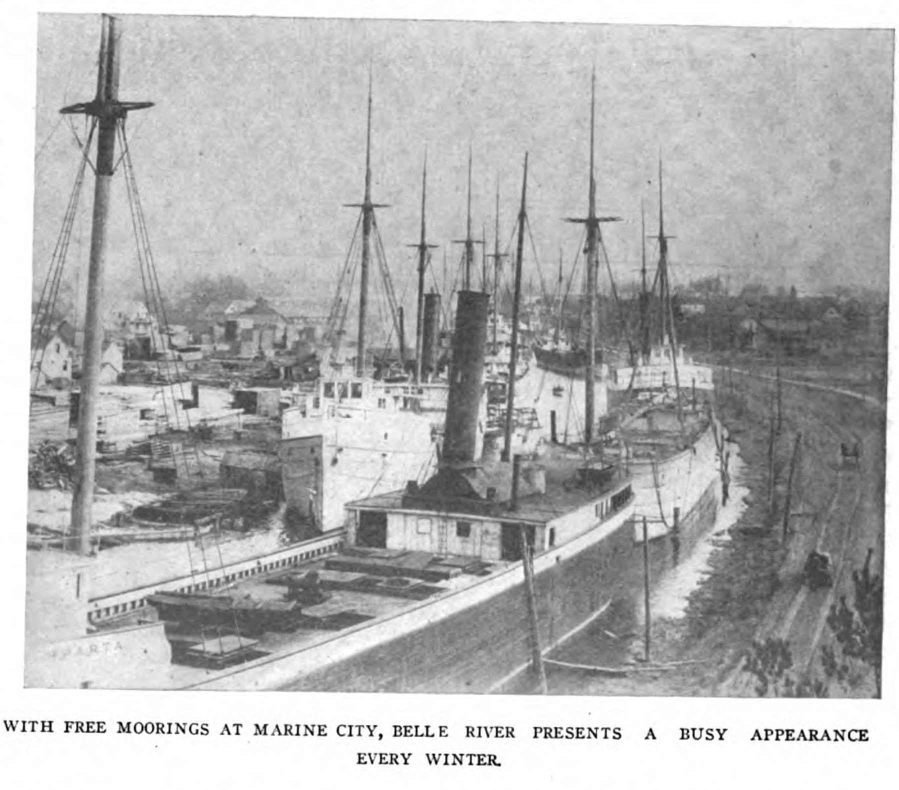
...from Bord... Kenyon, the repairs on all the boats will foot up in the neighborhood of $40,000. The Oscar T. Flint is to have a new rail and minor repairs, costing $1,500; George King, general repairs, $1,000; Tempest, overhauling, $500; Nelson Bloom, calking and overhauling, $500; Thos. Scott, general repairs, $500; Thomas Gawn, general repairs, $500; Titonia, general repairing, $1,000; Toltec, general repairs, $1,000.

The big work consists in cutting down the Sparta from a double decker to a lumber hooker to carry about 1,000,000 ft. of lumber. This is well under way and will cost $25,000. The Sparta was built at Cleveland in '74 and at one time belonged to the Hanna fleet. She was considered a crack boat in her day.

The Biwabik is to have new stanchions, rail, new ceiling, and mainmast, and rehewed hatches, costing $2,500. The Lozen will have all new hatches and part of her deck frames new, and will be entirely recalked, $3,000. The Gogebic gets a new floor, 12 new wing beams, new stanchions under hatches, five new upper deck beams, 3,000 ft. decking and reaming and calking all over, the expense figuring at $3,000.

A. P. Kenyon, proprietor of the yard, has inherited his ship building ability, his father, Martin Kenyon, having built the early river schooners, Sparrow and

...the building of the C. H. Davis, diagonally planked,



WITH FREE MOORINGS AT MARINE CITY, BELLE RIVER PRESENTS A BUSY APPEARANCE EVERY WINTER.

and C. H. Green, Nellie Mason, Rhoda Sonsmith and Mattie C. Bell. He has been in Marine City for the past seven years.

## MAY WITHDRAW FROM PACIFIC TRADE.

Owing to the fact that they are unable to compete with subsidized Japanese lines on the Pacific coast, the steamers Pleiades, Hyades and Lyra, of Boston, will be withdrawn from the trade to the Orient. They will probably trade from Seattle to Nome during the summer.

It is possible that the Boston Steamship Co., may also withdraw the steamships Tremont and Shawmut from the Oriental trade.

"We are obliged to discontinue the service," said an official of the company, "because we are unable to compete with the Japanese lines, which have every encouragement from their government, and which are paid a subsidy for every mile they travel. Every other government in the world but our own gives this subsidy to encourage their steamship lines, and until we get it contracts for the delivering of supplies to the Philippines will go to foreign lines."

McKay & Co., Eureka, Cal., will soon build a steam schooner for independent service. The vessel, which it is planned to have in commission Jan. 1, 1908, will be 150 ft. in length, 34 ft. beam, and 11 ft. deep. She will carry 400,000 ft. of lumber.

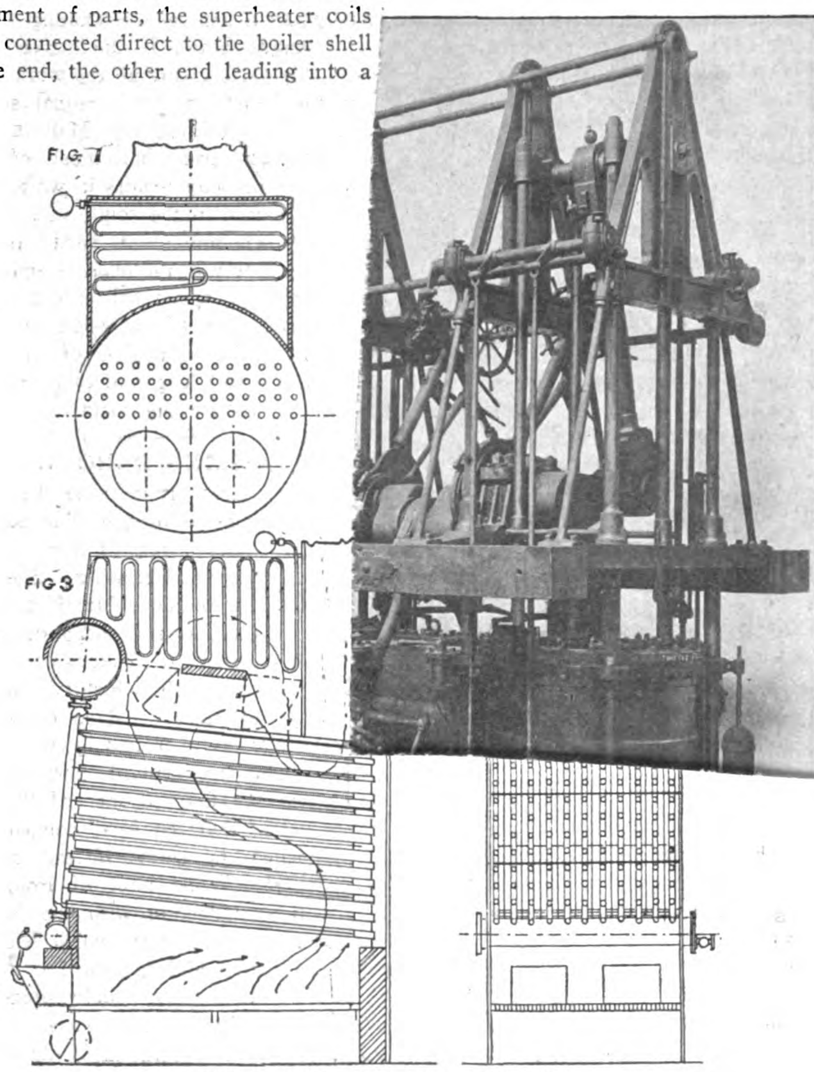
At a meeting of the board of trustees of the Buffalo Corn Exchange, Junius S. Smith was appointed lake weighmaster for the current year.

## NEW TYPE OF BOILER SUPER-HEATER.

The accompanying drawings show a new type of boiler superheater being placed on the market by Hans O. Ker-ferstein of 624 Fourth Ave., Brooklyn, N. Y. This invention shows a new arrangement of parts, the superheater coils being connected direct to the boiler shell at one end, the other end leading into a drum or receiver on the outside of the superheater, it being claimed that this method means a saving of 15 per cent in the cost of construction. A further object of this invention is to provide dampers located between the superheater and the boiler flues by means of which the flow of the gases and other products of combustion may be controlled and regulated, thus keeping the superheated steam at the most advantageous temperature for the highest efficiency of fuel.

By means of the dampers the gases from the furnaces may be permitted to pass through the boiler flues direct to the smoke stack without coming in contact with the superheater, or the gases may be divided, one portion passing through the superheater to the stack, the other portion passing from the furnaces directly; or, finally, the entire products of combustion may be made to flow through the boiler passes, the superheater, and thence to the stack by the remainder of the uptake.

A system of baffle plates and walls deflect the gases in the direction in which er shafts by which the pumps are driven. Between the cylinders is the hot-well on




KERFERSTEIN'S BOILER SUPERHEATER.

times it is accessible for inspection or repairs, all that is necessary being to close the dampers.

In the accompanying drawings examples are illustrated of the general principles of the superheater boiler adapted for use with different styles of boilers. Figs. 1 and 2 show two different views, in section, of the ordinary type of multitubular boiler, Figs. 3 and 4 showing sectional views of a water-tube boiler. In Fig. 2 can be seen the swinging damper located in the uptake, a double damper being necessary in the case of the water-tube boiler, as seen in Fig. 3. This superheater can be applied to the ordinary multi-tubular, water-tube, or, in fact, can be adapted for use with any type of boiler.

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One of the two new battleships of the Dreadnought class may be built at the Brooklyn navy yard.

## CAPT. GUY H. PAGE.

There may be younger masters of steamers on the lakes than the man whose picture appears here, but they he The model represents on a fairly large scale the very best practice of the period when it was made. It was taken as proved that the proper piston speed for a marine engine was 240 ft. per minute, and as this did not give a sufficient number of revolutions to the screw, gearing was introduced. The Simla was a P. and O. boat, one of the first in which screw propulsion was used. The nominal power of the engine was 600, but it probably worked up to about 2,500 I. H. P. This model is, as far as is known, the only one in existence of geared screw engines. It cost over $20,000. The workmanship is exceptionally fine. The present owner, Mr. G. Des Vignes, of the West London Engineering Works, found the model in a yard and put it in order. It is a matter of everlasting regret, says *Engineer*, London, if it is not bought by some science college or museum. It is impossible to get anything more typical of the current of engineering thought and practice at a time when Great Britain still led the world in mechanical art. We understand that the model is for sale, and it can be inspected by any individual or institution desiring to purchase it.

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WORK AT KENYON'S

he took his second examination and became first mate. A few days ago he successfully passed his third quiz. Capt. Page lives at 461 Congress St. East, Detroit, and is a graduate of the Barstow school and of the Detroit Business university. He completed his business course before he was 17 and has good business ability. Capt. Page is six feet tall.

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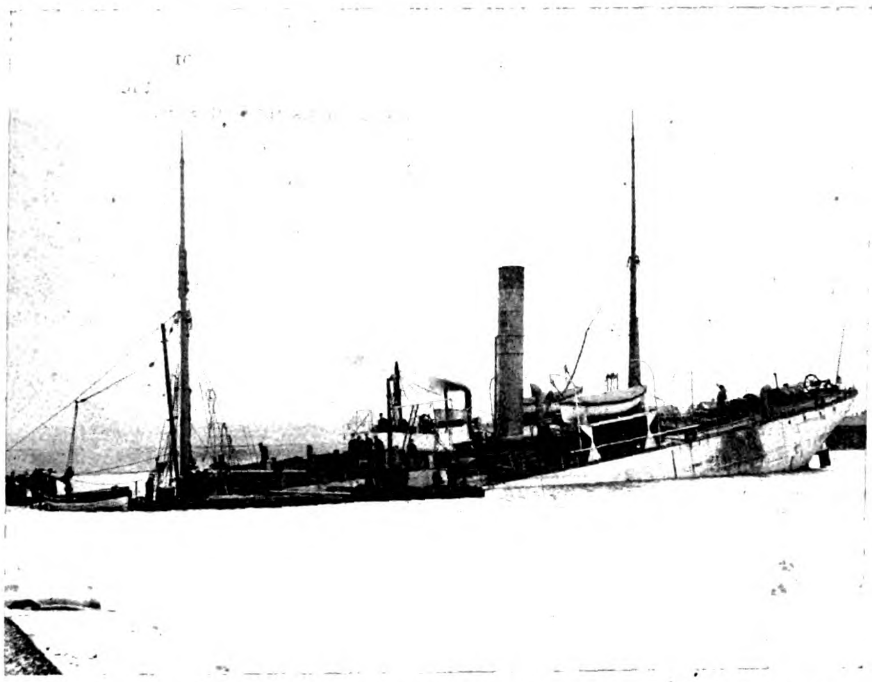
## COREY'S RECORD.

The steamer Wm. E. Corey, Capt. Fred A. Bailey, of the Pittsburg Steamship Co.'s fleet, made a wonderful record last season. The steamer was in commission 240 days, traveling 44,522 miles and carrying 302,547 tons of iron ore. She delivered 30 cargoes, which means that her average cargo was a little over 10,000 tons. In 1890 the steamer Manola, formerly operated by Pickands, Mather & Co., was the largest vessel on the lakes. In one season she, too, made 30 trips, but moved only 66,300 tons of ore. These figures prove that the carrying capacity of the Corey is nearly five times as great as the carrying capacity of the largest vessel on the lakes 16 years ago. Mr. Harry Coulby, president of the Pittsburg Steamship Co., handled the Manola when she made her record, just as he is now handling the Corey. It will be interesting to note whether the laurel goes to the Cole this coming season.

## BRITISH STEAMER SUNK IN DOCK.

When the steamship Dordogne, outward bound with a full cargo of coal for Spain, was waiting to get into the river at Newport, Bristol Channel, on Saturday, Dec. 22 last, the steamer Don Arturo, from Bordeaux, came into collision with her. The latter's propeller caught the Dordogne amidships and in a few minutes the Dordogne began to sink and eventually came to rest at the bottom of the dock, only her stern showing above water, as shown in the illustration. She was successfully floated on Saturday, Jan. 5. A very strong wood cofferdam was built around the submerged part of the steamer, and all openings closed up and pumps set to work. In a few minutes the ship commenced to rise. Notwithstanding that she had a full cargo of coal aboard. She was immediately put in the Tredegar dry dock, Newport, to undergo damage repairs. The work was carried out by the Tredegar Dry Dock & Wharf Co. Ltd., Newport, under the direction of Mr. J. W. Shotton, the Bristol Channel representative of the North of England Steamship Insurance Association, whose salvage apparatus effectually pumped the water out in a very short space of time.



SALVAGE OF S. S. DORDOGNE, SHOWING THE VESSEL SUNK IN ALEXANDRA DOCK, NEWPORT.

## QUIZ OF COASTWISE LINES.

John Sharp Williams has introduced a resolution in the house looking to the determination of the question whether or not the New York, New Haven & Hartford railroad or the Southern Pacific railroad has purchased the coastwise steamship lines which are protected from foreign competition by the coastwise laws of the United States. The resolution calls upon the department of commerce and labor to furnish whatever information it has, together with all documents in its possession bearing upon the subject which would go to show whether or not the New York, New Haven & Hartford, the Southern Pacific, or any other railroad has purchased or owns in whole or in part any of these coastwise vessels, to what extent they own them, and to what extent the coastwise trade is in possession of the so-called holding companies.

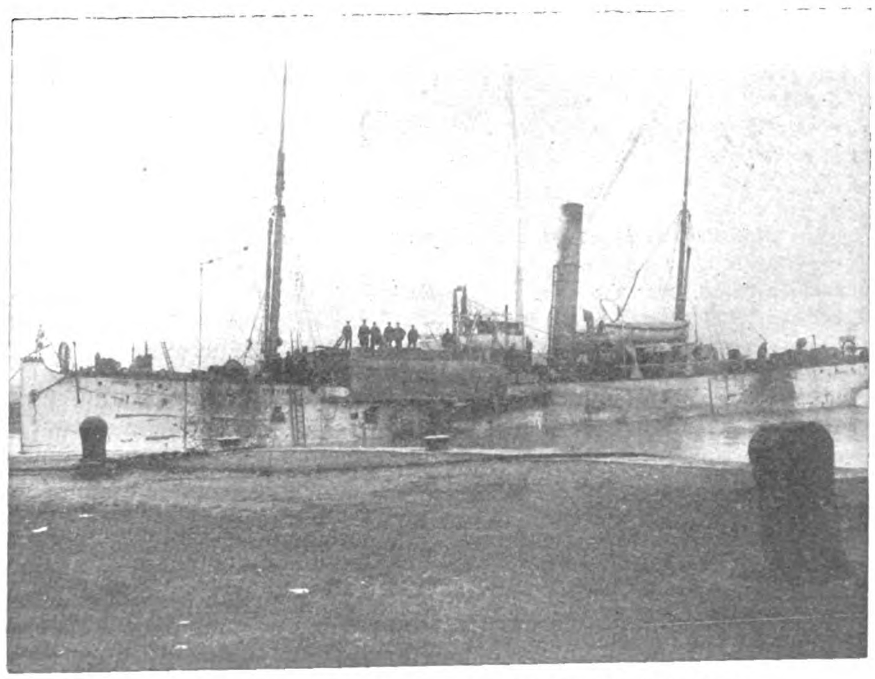
## AMERICAN VESSELS TO CARRY COAL.

That our national legislators have decided to protect American shipping to some extent is shown by the fact that the house of representatives in committee of the whole recently refused—34 to 51—to permit a temporary suspension of the law of 1904 requiring the transportation of coal intended for the navy to the Philippine islands in other than American bottoms.

Mr. Foss of Illinois, chairman of the committee on naval affairs, supported the proposition, which was submitted by W. W. Kitchen of North Carolina, a Democrat, member of the committee, as an amendment to the naval appropriation bill. He said the navy department found itself unable to secure charters from owners of American ships to carry the 150,000 tons that would have to be transported in 1907-8, and Mr. Kitchen said the government would save about $400,000 if the amendment were adopted.

## BRITISH NAVAL MANEUVERS.

The British navy will enter into a series of maneuvers off the Portuguese coast shortly. The fleet will include thirty first-class battleships, sixteen armored cruisers and fourteen protected cruisers, the aggregate displacement of these sixty vessels being 681,725 tons. This is by far the largest fleet ever assembled for any purpose whatever, and has been made up without drawing upon the reserve squadrons. It exceeds the present combined battleship strength of France and Germany.



SALVAGE OF THE S. S. DORDOGNE, VIEW AFTER BEING FLOATED.

THANKED HIS STARS THAT THE END OF THE WATCH WAS NEAR.

**"IN THE MERCHANT SERVICE."**

The Arlington wasn't making any too graceful a shape of it as she butted along in the face of as dirty a piece of weather as she had been up against that winter. Taking the seas over the head as she had been doing, had washed her iron decks unusually clean, incidentally washing about 30 ft. of rail, a lifeboat, and a few other trifles, over the side.

It certainly was one dirty night, and the Third, down in the engine room, thanked his stars that the end of the watch was near. The crash and jar of the Arlington's old "box o' tricks" had, he said pretty well jolted the liver out of him, as he sprawled and slid around the floor plates, dodging the douche of green sea coming down through the skylight. As the engine room was a regular bakehouse, they usually ran her with the skylights open. Even if they hadn't, who was going up on the spar deck to shut 'em this weather? Besides, a little seawater freshens the atmosphere up, and as the Arlington wasn't exactly a yacht in the matter of polished work, having none in fact, there was nothing to spoil.

It was just on the stroke of midnight and she was riding steady after a more than usually exultant plunge, when the Third was surprised to hear the clang of the telegraph and see the wavering finger on the dial grimly pointing to "Stand By." A couple of seconds later the first assistant, Campbell, came scrambling down the ladder with the Second at his heels, their spray-drenched clothes showing that they had been on deck for some purpose or another.

"Better get into the fire room, Harris," said Campbell; "there is a big Dutchman lying ahead of us—disabled, I guess—and we'll be stopping presently!"

Harris trotted off to the fire room to find that she had just taken a sea down the fiddley. She was now rolling heavily, and everything—fire-tools and firemen, barrows and coal—were washing back and forth across the foot-plates.

"I wonder how she will take it when we stop," he muttered, as he grabbed for the waist-belt of a coal-passer rolling among the debris, he himself dancing around in six inches of chilly water. "Who wouldn't sell a farm to go to sea?"

Having got things straightened out, and seen her all right for the coming stoppage, Harris made his way back to the engine room, where the other two waited expectantly.

"Think there will be anything doing?" he asked.

"Can't say," answered the First. "We might have to pick her up and tow her into New York, same as we did on the Amapis in '89 when we towed in the Atillo."

"Was it a big job?" asked the Third, who was getting interested at the possibilities of the venture, "and what did you make out of it?"

"Well, I was Third of the Amapis at the time, and we picked the Atillo up about a thousand miles from port. We had some trouble with the cables parting and our steering gear gave out once or twice, but we got her in all right. Four hundred dollars was my whack of the spoils, and a very handy little sum I found it."

"Four hundred dollars," echoed the Third. Lord, the things he could do with four hundred dollars. Some of these little old debts ashore would be paid off; yes, and plenty left over to pay for some house furniture when the time arrived. Then, again, there were a few things that he might put the money out on, things that he didn't feel like buying from his month's pay.

"Of course," said the Second, in talking it over with him later, "I would have in that case a matter of about five hundred, if we get paid in proportion to our rating." Yes, five hundred would be sufficient to give him that much longed-for trip off, perhaps a couple of them, when he could go down home and rusticate. What times he would have!

By this time the engines had been slowed down, and the First had gone on deck to have a look at the prize.

"Say, Billy," said Harris from the boiler room door, "if she is as big as the First says, perhaps she will be worth a lot more to us." Then they both fell to dreaming again as they balanced themselves to the heavy rolling of the Arlington.

Suddenly the telegraph rang a sharp peal, and with the order "Full Ahead," the engines were set away, and the Arlington set her head to the seas again.

"Surely we haven't got her in tow already," said Harris, and they both peered up the ladder in time to see the First slowly descending.

"How are we making out, Mr. Campbell?" asked Harris, as he dodged another cataract of sea water from the skylights.

"All right, I suppose," responded the First, "the Dutchman is back there about a mile, signalling to everybody concerned that she don't want any help, worse luck."

It being now the change of the watches, the Third went upon the wet deck. Away astern he could see the great black hull and the lights of the floating hotel.

"What could you expect of a Dutchman, anyway?" he growled, as he strode into his cabin, banging the door after him.

THE "STAND-BY MAN."

## SEEN AND HEARD IN THE ENGINE ROOM.

Not as on board large ocean steamers where the captain, or the officer on the bridge, "telegraphs" his orders to the engine room, on harbor, river and lake steamers the officer in charge on deck voices his commands to the engineer per bells.

When twin engines are carried on harbor craft it is customary to install two bells and one gong in the engine room; a bell for each engine and the gong for giving an order that applies to both engines.

To illustrate this:

Both engines on board a twin screw steamer are "working ahead." One ring of the starboard bell is an intimation to the engineer to stop the starboard engine. Upon the gong then being sounded once the starboard engine is started working ahead and the port engine stopped.

From this it can be observed that the captain, or whoever is "pulling bells," must ever remember the last order he sent down to the engineer. In other words—the advantage of a telegraph over a bell is that the former registers all orders, both in the engine room and on the bridge, while the efficiency of the latter depends greatly (shall I say solely) on the memory of the operator.

Also—again referring to the twin bells in the engine room of a twin screw vessel, not to mention the gong, which is another story, or, rather, makes another noise—the two bells, especially to a novice, sound alike. Not long ago an assistant engineer was hired by the Long Island Railroad Co. for one of the twin screw passenger steamers.

Upon leaving a dock, or when "making" one, each engineer "handles" an engine.

To the newly hired assistant—he was assigned to the post on the port platform—both bells sounded alike, though the old chief could ever distinguish them.

But the young assistant proved equal to the occasion.

He mufiled the sound of the port bell by wrapping some paper round the clapper.

NECESSITY IS THE MOTHER OF INVENTION.

Though doubtless the question "how would you like to be the iceman" may be variously answered, to "how would you like to be an engineer with the boiler's water gages out of commission" only one answer is expected. A cold draught of air striking the glass is sufficient to break it. But a regular epidemic among the available supply of gauge glasses is most often caused by an inferior brand of packing rings.

When the supply of packing rings happens to be exhausted the versatile engineer manufactures new ones from for instance, an old circulating pump valve.

Then the rubber proves too—soft to stand the water, or steam, pressure, a leak occurs, and—away goes another glass.

Here is an old engineer's remedy for the above named complaint:

"Serve"—(to wrap all around)—the ring with a fine strand of asbestos cord. Also, serve closely in order to prevent action of either steam or water on the rubber.

Even a ring of most inferior rubber thus treated will stand a pressure of 200 pounds.

The engineer who gave this advice once steamed for three days and nights without the aid of a water glass. And any engineer can understand the amount of amusement there is to be derived from an incessant testing of pet cocks.

The engineer here already twice referred to once explained this remedy to an old lady who was ever afraid of being blown up.

Fancy the captain of an ocean liner's surprise when this same lady found her way to his sanctum, the charthouse, with the startling request: 'Will you please find out if there is a goodly supply of asbestos cord in the engine room department?"

Just at the time of relieving of the watch at 8 p. m., the fourth engineer on S. S. Cathay, of the Peninsular & Oriental Steam Navigation Co., on a voyage from Suez to Bombay, observed water issuing through cracks in the stokehold plates. Upon removal of some of the plates the bilges were found to be full of water.

It then appeared that the plug from the "scum" cock (fixed on the ship's bottom)—had blown out by reason of the violent vibrations resulting from oft repeated "scumming" (to freshen water in the boilers.)

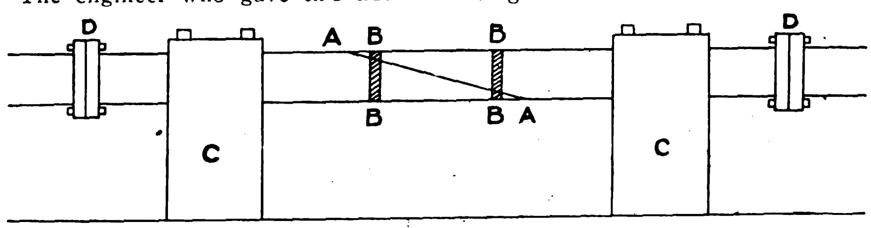
No diving suits being available an amphibious engineer imitated a Ceylon pearl diver.

Anyhow, down he went to the very bottom of the ship, returning with the plug and gland.

This gland and plug were then securely fastened to a "T" spanner. Once again the pearl fishing act to insert the plug, whereupon two men forced it down.

Both deck and engine pumps were then set to work to return some of the Red Sea whence it came.

When it is known that there was 10 ft. of water in the forehold and 5 ft. in the engine room the efficiency of the Cathay's pumps cannot be questioned. They (the pumps) made said S. S. Cathay "bilge free" in three hours. The P. & O. Co. substantially rewarded the chief engineer, but the latter emphatically refused to divulge the amount he received.




INTERMEDIATE SHAFT OF S. S. ARRACAN OF THE BRITISH INDIAN STEAM NAV. CO. A A—BREAK—(OLD WELDING.) B B—PINS—2½-IN. C C—BEARINGS. D D—COUPLINGS.

HE MAY BE BASHFUL, BUT—HE CAN DIVE.

"Things are not always as they ought to be," said an old engineer. This was apropos of an intermediate shaft on board the S. S. Aracan of the British Indian Steam Nav. Co. having been welded and breaking on the "scarf."

This accident happened during a trip from Point de Galle to Bombay (called coasting).

The chief engineer, M. Ward, could not be phased by even such a calamity as the breaking of a shaft.

Two holes (two and a half inch each) were bored through the shaft at the spot where the break occurred and two solid pins made from a boat's davit inserted in these holes.

To make assurance doubly sure two clamps, also fashioned from that same davit, were affixed round the wounded part of the shaft.

Then full speed ahead; arrived safely in Bombay; time occupied in making the repairs thirty-one hours.

Mr. Ward is now in New York and he knows his business.

That he is in New York I know because I met him there, and as for knowing his business—he told me so.

Man, know thyself.

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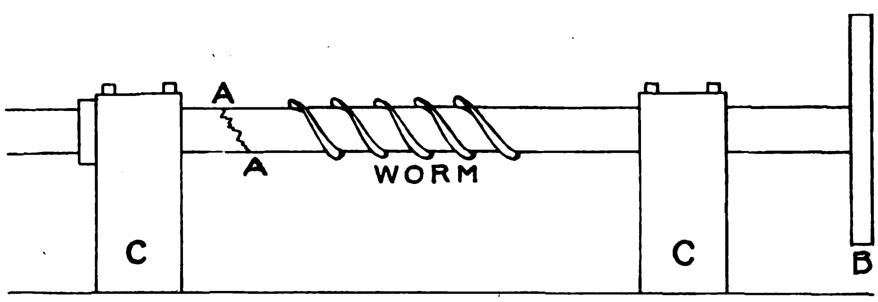
The British steamship Eretria was ready to depart from Newcastle, Australia.

The engineers had received the telegraphic order: "stand by," and the hawsers were being hauled on board.

Then the hand on the dial in the engine room moved to "half speed astern"—the chief grasped the handle of the throttle valve, an assistant wrestled a moment with a large wheel, and—the wormshaft of the reversing gear snapped.

Keep fast to the dock—helpless as far as the engine is concerned. The body of the shaft was reduced 3 in. at each end of the break. This necessitated cutting one inch from the worm.




BRITISH S. S. ERETRIA'S WORMSHAFT OF REVERSING GEAR.
A A—BREAK. B—REVERSING WHEEL. C C—BEARINGS.

Then "sleeved" the shaft—a self explanatory term.

Commenced the surgery at 7:30 a. m., patient ready for duty at 4 p. m.

Was the operation successful?

S. S. Eretria was reported off Sandy Hook Dec. 30, 1906; all well on board, including the wormshaft of the reversing gear.

During a trip of S. S. Punjab on the Brahmapootra river, East India, the injection water failed to make its so necessary passage through the condenser.

After careful investigation the trouble was located in the "main injection," by which is meant the box against the ship's side in which the valve is.

The engines were, of course, stopped.

A wooden cover was then made for the injection chest, while two men stood by with "jacks."

The cover was then taken off; valve drawn and debris removed. It was all done within two hours.

To give an inkling of the drenching to which those who aided in the work were subjected it needs only be mentioned that the steamer drew 10 ft. of water.

But, then, the water of the Brahmapootra is tepid.

With reference to the 20th century custom of women to engage in the professions formerly more exclusively regarded as mere man's, a gentleman proposed the following toast: "To the ladies—once our superiors, now our equals."

While it may be true that we were all born free and unequal, one lady last summer boarded the S. S. Middletown, trading on the Connecticut river, with the more or less irrefutable proof that she was the chief engineer's equal.

At all events, she proudly showed a certificate as A1 engineer issued by a corresponding school.

Dressed in something of white material to which Laura Jean Libby refers as being both clinging and immaculate, she gave the Middletown's crowd a suggestion of particularly bright flag waving over a decidedly delapidated mudscow.

Proudly presenting her "diploma" to the chief she requested the honor of being allowed to "handle" the engine when making the next stop. It was not then so much a case of "when knighthood was in flower" as "when chivalry was displayed in the engine room."

Anyhow, the feminine engineer was permitted to shut off the steam when the order to stop was given from the deck.

Also—she managed to open the throttle valve again when a request came for a "kick ahead."

It should be mentioned that the oiler on the Middletown wanted an excuse for having a nearer view of an engineer dressed in skirts. On the principle that anyone wishing to beat a dog can easily find a stick, the oiler came on the front platform ostensibly to fill the open cups of crossheads and pins. And he filled them to the brim.

The result was that the correspondence school graduate starting the engines was liberally sprinkled with oil.

As might have been expected all the enthusiasm for applied mechanics was dampened by regret over misapplied oil.

Das ewige weibliche.

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The dumper Cinderella is owned by the City of New York, though this is nothing for the city to be proud of.

The whole contrivance called Cinderella is in reality a garbage box with a whaleback steamer riveted to two of its sides. The box is divided in eight sections, or pockets, and each pocket is provided with two doors in the bottom for the dropping of freight.

Loaded she carries about 350 tons.

Recently she started (slowly, of course, for that garbage box stuck several feet below the water's surface) for Scotland light with a full load of assorted refuse, when it was ascertained, per the chief's nose, that the high pressure crankpin of the port engine was running hot. And of all the causes—some practical joker had filled the cup with emery.

Luckily the chief has a splendid nose for hot bearings and the starboard engine was able "to go it alone" until its mate had cooled off sufficiently from the effects of the witticism.

When off the statue of liberty, with both engines going full speed ahead, the shapeless mass called Cinderella was thrown on its beam ends. More trouble.

It appears that the teeth of the cogs which fit in the wormgearing of the dumping apparatus gave way, with the result that one of the doors of one of the pockets suddenly opened. And down went 75 tons of mud. Then the sister door flew open and Cinderella settled once more sedately on a level keel.

Keep on full speed ahead.

Should no more emery be distributing over the bearings and if the cogs, chains and hinges stand the strain, dumping scow Cinderella guarantees to deposit its load where it belongs—10 miles S. E. of Scotland lightship.

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A decidedly youthful engineer, both in appearance and in years, had been "holding down" the chief's job on a small harbor tug for a few days. His predecessor had warned him about the tendency of the crankpin keys of this particular job to break.

For this reason it had been found advisable to fit the pin with a "soft" key; and the highly tempered steel key had been relegated to the obscurity of the seat locker.

Then arrived an experienced old timer to take the place of the youthful encumbent of the responsible position at the throttle.

The latter took the liberty to acquaint his successor with the engine's peculiarity of being "death on keys."

"Youngster," said the ancient one,

"I was squirting oil before you were sucking milk and this engine is going to be fitted with that hard, steel key now reposing ignominiously under the seat."

And speedily the crankpin was provided with the key referred to—a testimonial to pride inadvertently wounded.

The young fellow then went ashore, leaving the old man in full charge of a now dangerous engine.

The tug had hardly been worked clear from the dock when the key broke. Of course, if nothing further had happened the engineer could easily have replaced the key his pride induced him to reject.

But—when the accident happened there was 150 lbs. of steam upon every square inch of the piston.

The piston having been forced through the cylinder head at a moment when the engineer was leaning over the engine the latter's usefulness was temporarily and the former's impaired for all time.

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The accident in the engine room of the steam yacht Colonial was, to say least of it, peculiar.

The main steam pipe burst while the vessel was at anchor. Having some hours at anchor and there not being any expectancy of an order to sail before the following day the steam had been allowed to go down. And with this slight steam pressure the pipe burst. The chief engineer and two firemen were killed by the escaping steam. It then devolved upon the second engineer to report the accident; and his report was certainly like the soul of wit—brief.

"The steam found a weak spot in the main steam pipe; my chief and two firemen are dead."

None could question the truth of this report; still—it is far from satisfactory.

Why should steam at a low pressure find a weak spot which high pressure steam failed to find?

And where and of what nature was this so mysterious spot?

The second enginer of the Colonial may have a splendid nose for news but he appears to have a tongue which lacks the ability to communicate it to others.

Hot air.

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## WHEN THE COAL RUNS ITSELF.

BY JAMES ROSSAN.

"There!" said Patrick Casey, coal passer on the old wooden steamer Magnolia, as he hove the wheelbarrow viciously into a corner. "Ye can go to blazes and stay there for all I care." The check-bell had just rung for Chicago, and the tall pile of coal on the stokehold floor would be sufficient until the steamer arrived at her dock.

Patrick now proceeded down to the forepeak where his quarters were located. Although it was high noon he lit a smoky kerosene torch. Then he went to the barrel on deck, procured a half washbasin full of water, and attempted to wash the central portion of his face. After repeated attempts he gave it up in disgust. By the aid of an old broken piece of mirror he carried for such emergencies he ascertained that his celluloid collar did not reach over the high water mark on his neck, so he just turned up his coat collar, that reached a couple of inches higher. Next he wrapped three red bandana handkerchiefs, one torn undershirt, two pairs of soiled socks, one clay pipe and half a package of tobacco in a newspaper, and went aft spick and span, fit and ready for the momentous event of severing connections with his employers.

The lynx-eyed second engineer discovered him in his usual state of finery, and ventured a guess.

"Are you going to quit us, Casey?"

"Yis-sor."

"What's the trouble, Casey? Haven't we used you all right?"

"Shure, it's a foine lot of min ye'se are to wur-rk for."

"Maybe we can fix it up, Casey. Better stay, you know it's hard to get men now."

"No-sir."

"Going to have your drunk, eh? Is that it?"

"I guess so, maybe that's it."

So Casey left the good ship Magnolia, and an hour later found him up at Callahan's filling up rapidly on conversation water. Here, among his associates and equals, and loaded to the brim with rapid transit booze, the pent up feelings of one complete round trip found vent.

"A stame boat," he began. "No, no, mates. She was what I'd call a bloomin' lefthanded, stern forninst miscarriage."

"Was she a coal-eater?" Johnson asked.

"Naw, she was a lead pipe cinch for coal. About the softest snap I ever had, but it was the onhandy way of gettin' it that used to make me blood boil. Now I'll not say as what them fellows that build the boats are smart fellows. But the one what built this one must'a been born in the sign of horrors, for ye can be sure he done a horrible job. Shure the bunkers lay two hatches for'ard o' the boilerhouse, and me a trottin' along with that crazy old wheelbarrow, crossin' six combings covered over with towboards; thin a quick dodge to the lift to clear the front ind of the boiler; nixt over a baby mountain built over the feed-pipes, and thin sharp to the right and a quick drop into the stokehold. Well, I began to size up the layout. And there was cargo piled up forninst, astern and beside the boilers, and the fuel amidships. And, be the howly Saint Patrick the space goin' to waste would have brought tears to the eyes of any half decent skipper. Shure there were passages up to those bunkers that looked like a map of the coast of Ireland. And the guy what put the boilers in spread them out as if he thought they were afraid of each other. I'll swear any decent man could've made room for half a coal mine beside that stokehold. Says I to meself: 'Casey, ye're a darn fool. Someone is making a monkey of ye, makin' ye do all this work for nothin', and ye're not goin' to stand for it.' So I quit. And then the idea of putting the coal-passers down in the forepeak alongside o' the sailors, when they know that they hate each other like poison. Shure the first day out one of 'em got fresh and I had to hit him a swat in the jaw. Now mates, ye know that I'm not finniky or given to primping, but a clean room with light and water in it has its uses."

Casey kept up his oration on the disadvantages of the Magnolia until the early hours. Then the booze got the upper hand and they rolled him out in the gutter. Later the wagon picked him up, and in the morning he received his usual thirty days, after which he shipped out in something even worse than the Magnolia; and thus the merry jig went on.

Now it chanced that some years later I took a stroll along the waterfront. As I passed Callahan's I heard boisterous voices inside, and said to myself: "There's my friend Casey at it again." Imagine then my surprise when I glanced in through the broad windows of the free reading room, and saw Casey sitting at one of the tables busily perusing a paper. He was certainly a changed man. Why, his appearance was almost dudish with a stand-up collar and a frock coat. I could not withstand the temptation, but went in.

"Why, Casey, how is it you ain't over there?" I began, jerking my thumb back over my shoulder toward Callahan's.

"No more o' that for me," he answered.

"Good gracious, have you had 'em?"

"Had what?"

"The snakes."

"No-sir."

"Had a bad spell of sickness, I suppose?"

"No-sir."

"You must be in love."

"No; that is, not with any woman."

"For goodness sake, Casey, let's have it. I'm just dying to hear how it happened."

He pulled a handsome yellow watch from his pocket, glanced at it, and said: "Well, I've just an hour, me boat sails at six."

"What, are you still steamboating, and leading a life like this." I threw at him in open-mouthed astonishment.

"Ye see," he went on, "I've found a home. I've the swellest, slickest job between here and Buffalo. They draw the line at drinkin'. This is me second season on her and I wouldn't take no chances on losing it."

"Ah, I see," I broke in. "You are with some engineer who don't work you very hard and treats you like a prince?"

"No-sir, he's the most partikkeler, fault-finding, cranky cuss I ever rode with."

"Then it's the second who is a gentleman, and you are his favorite coal-passer."

"No-sir. He's the worst kind of a slave-driver. There's polishing and scrubbing and painting, and no end to it."

"Great Scott, man! What in the world keeps you there?"

Casey leaned close to me and said in a half whisper, just as if he was afraid someone might steal his secret. "She's a steamboat. Great God, man, you ought to see her. Things are right on her. Bunkers for three hundred ton all around the stokehold. Ye sling yer tackle and pull up yer door and it runs into the stokehold every blessed bit of it."

"She must be a regular cinch, no work at all," I interjected.

"Good Lord, no. She's a stiff proposition. She burns her two tons an hour, and it keeps ye humpin' to spread it over the floor. But then that isn't the idea. Nobody can help that she's stiff, and ye are sure that ye have things as handy as they can be made. There's a heap of comfort in that. Then we've ashguns to shoot the ashes out with, they're the slickest things ye ever saw. Besides there's electric lights and no end of automatic things. Oh, it makes ye feel as if ye were somebody to work on her. We sleep on deck nixt to the boilers, and never know whether there is a bloomin' galoot of a sailor aboard, and don't care a darn. There are shower baths and tubs galore, and we have to get into them so often or the Old Man gets a conniption fit. But then we're kinder getting used to it now, and have to do it to hold our jobs. Ye can bet the man who built that boat had a head on him. He knew how to build her so she'd hold her crew. When ye work on her ye feel that ye're a steamboat man and not a sewer-digger or a farmer. And the coal runs itself, every blessed bit of it—man, think o' that."

"But now,"—and here he glanced at his watch again, "I'll be goin'. I go on at six, and I wouldn't lose her for the world."

## BIDS FOR REVENUE CUTTER.

Washington, March 6.—The treasury department will be in the market this year for $750,000 worth of revenue cutters and sea-going tugs. Congress this year authorized an increase of $30,000 for the appropriation which was carried last year for the construction of a revenue cutter. After two unsuccessful attempts to secure bids under the authorization of $160,000 the secretary of the treasury asked for an additional appropriation of $30,000, which was secured this session. Under this authorization new specifications have been prepared and Tuesday the secretary of the treasury advertised for new bids.

The increase of the new vessels provided for in this bill amounts to $650,000. One new steam cutter, first class, to be used at Puget Sound, $250,000; same class of vessels for Savannah, $200,000; a sea-going tug for New Bedford and the Atlantic coast, $175,000; and a boarding vessel for New Orleans, $50,000.

At the treasury department it was stated that bids would be asked for within a month or two for the first of the vessels that are authorized by this year's bill.

## IRON SITUATION.

The purchase of 5,000 tons of Bessemer pig iron by the Carnegie Steel Co. for March delivery at $22 for valley furnace during the past week is believed to be significant in indicating that the output of the Carnegie furnaces is still inadequate and further purchases are expected. The pig iron market is firm. Sales of about 75,000 tons of southern iron are reported, and in spite of some weakness in the Chicago market, the southern product is strong. Transactions in northern foundry pig iron were not numerous. An interesting feature of the situation of the week was the appointment of a committee of their number by the agricultural implement manufacturers which will endeavor to obtain a concession of $2 per ton on the price of steel bars for annual contracts ending June 1, 1908. Manufacturers state emphatically that no concession will be made.

## BOOK ON STEAMER SHEADLE.

The MARINE REVIEW has published in book form a complete description of the bulk freighter J. H. Sheadle, built by the Great Lakes Engineering Works, for the Cleveland-Cliffs Iron Co. This description is quite complete, both as regards hull construction and engine data, including the performance of the steamer on her trial trip. It is illustrated with numerous line drawings and half-tones from photographs, and contains much information that naval architects and marine engineers, as well as laymen, in all parts of the world might like to know. The book in book phrase would be known as a flat, the pages being 8 x 12 in. It is printed on enamel paper, and is bound in Havana brown cover stock. The price is 50 cents.

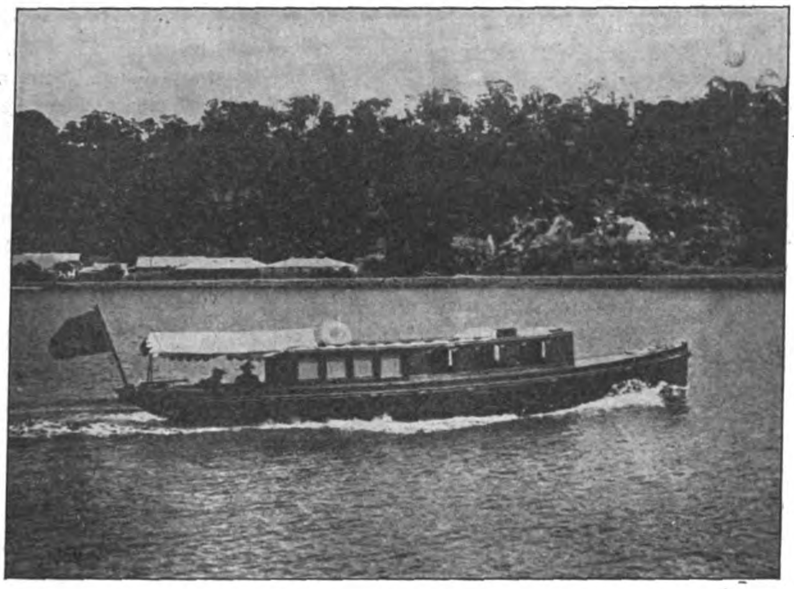
## AUXILIARY LIFE-SAVING SERVICE.

Mr. John Arbuckle, who has on several occasions attempted to ameliorate the hard conditions under which the very poor live, by most original methods, has now a plan to establish on the coast cities of the United States an elaborate life-saving service of a novel character. Briefly Mr. Arbuckle's plan is to station along the coast at his own expense the most powerful ocean tugs that can be built. These tugs are to be equipped with wireless telegraph apparatus and all the latest devices for rescuing persons from wrecked vessels. They are to keep up steam day and night. When a wreck occurs, the life saving station that discovers it is to communicate with the nearest tug which will immediately steam to the scene. The tug will then anchor to windward of the wreck and by distributing oil upon the waters make it possible for small boats to reach the wrecked craft. Mr. Arbuckle wants congress to authorize life saving service to keep his auxiliary service informed of all wrecks.

The Clyde line has placed orders with the Harlan & Hollingsworth Corp., Wilmington, Del., for two new steamers. One is for passenger and freight service on the St. John river, Florida, and will be about 185 ft. in length and 35 beam of hull, to be either side wheel or stern wheel and to attain a speed of 12 miles an hour. The second steamer is for the Charleston line and will be 375 ft. over all, 48 ft. beam and will carry 7,500 tons of cargo and 300 passengers. Her speed will be 14 knots.

## POLICE BOAT.

The accompanying photograph shows a boat belonging to the West Australian police into which a four-cylinder 52 B. H. P. Thornycroft patrol engine has recently been fitted in place of a steam engine with most successful results. The boat is 44 ft. in length, 7 ft. 9 in. beam and 2 ft. 6 in. draught, and its speed has been increased by about 50 per cent as the result of the change of motive power; its present speed being 13 miles per hour.



POLICE BOAT FOR WEST AUSTRALIAN POLICE.

In addition to the increase in speed there has been a considerable saving in the space taken up by the machinery and this boat is thus another example of the special value of an internal combustion engine for use in small craft. A photo of the Thornycroft engine with control and reversing gear is also shown. This engine was fitted in the boat by Messrs. Thornycrofts' West Australian agents, Messrs. Denny Bros., of Perth and Fremantle and the work was carried out to the entire satisfaction of the government officials.

It is interesting to note that similar engines were fitted in the shallow draught vessels Spider and Sandfly recently built at Chiswick by Messrs. Thornycroft to the order of the crown agents for the colonies. These engines are now using paraffine and are in charge of natives on the Calabar river, which speaks well for the simplicity of design, construction and control.

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The government army transports Dix, Sherman, Thomas, Sheridan and Logan and the cable ship Burnside, now on the Pacific coast, are to be equipped with wireless telegraph outfits.

## SHIP YARD NEWS.

The Skinner Ship Building Co., of Baltimore, has received contract for the fourth 100-ft. steel tug for the Standard Oil Co.

Moran Bros. Co., Seattle, Wash., recently laid the keel of a vessel they are to complete this year if possible to the order of Schubach & Hamilton.

The Old Dominion steamer Jefferson, recently lengthened 46 ft. by the Newport News Shipbuilding & Dry Dock Co., is giving satisfactory service.

The steamer Michigonne, building for the Harpswell Steamboat Co., Portland, Me., was launched recently by Neafie & Levy, Philadelphia. She will ply along the New England coast.

The keel for the sister ship to the Camden, of the Eastern Steamship Co.'s fleet was laid less than two hours after the Camden had been launched from the yard of the Bath Iron Works, Bath, Me.

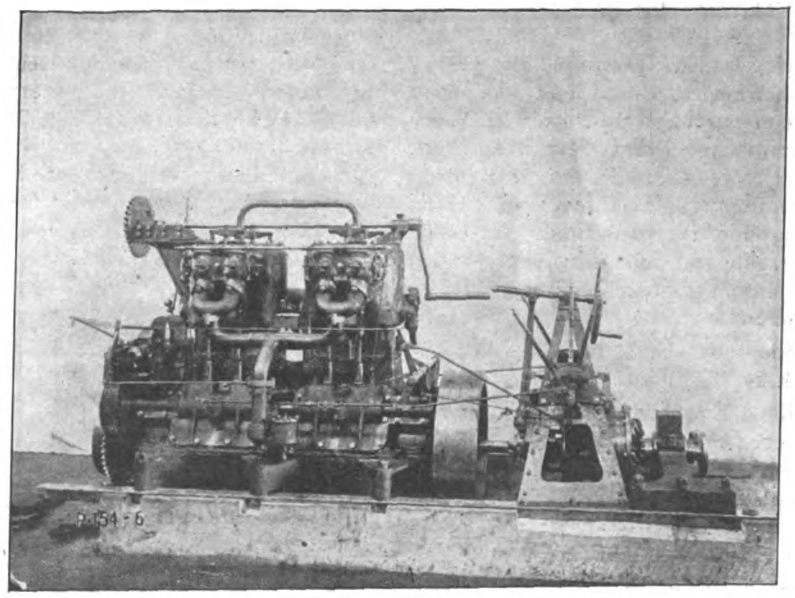
The Colonna Ship Building & Dry Dock Co., of Norfolk, Va., are to erect a ship building plant at Berkley, opposite Norfolk, at an estimated cost of $185,000. A large dry dock of a new style of construction is a part of the plan.

The steamers Brandon and Berkeley of the Old Dominion line will receive alterations giving them about forty additional staterooms and increasing their capacity one hundred passengers each. The Newport News Shipbuilding & Dry Dock Co., Newport News, Va., will do the work.

The steamer Juniata, of the Merchants' & Miners' line, is to be lengthened 40 ft., by the Newport News Shipbuilding & Dry Dock Co., Newport News, Va. The steamship Howard will substitute for the Juniata on the route from New York to Baltimore.

The Newport News Ship Building Co., Newport News, Va., has been awarded contract for a freight and passenger steamer for the Mattson Steam Navigation Co., San Francisco. The vessel will be 450 ft. in length, 54 ft. beam and 30 ft. in depth and will cost $700,000. She will ply between Honolulu and San Francisco.

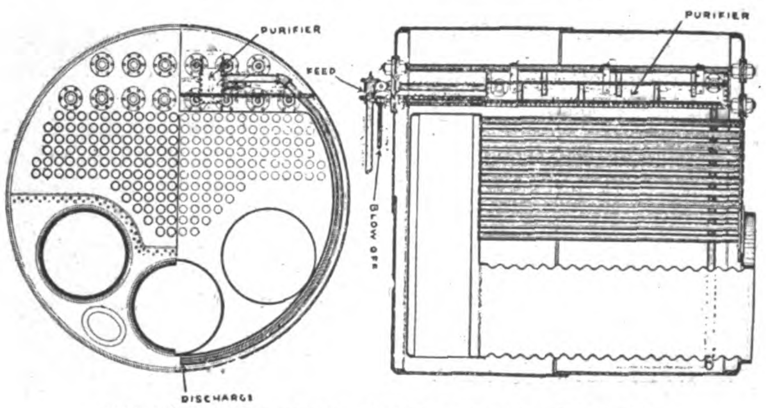
The City of Peking, of the Pacific Mail Steamship Co.'s fleet, will be obliged to undergo extensive repairs, as the San Francisco inspectors found serious deterioration after the vessel was dry-docked for the purpose of overhauling the machinery. The City of Peking is thirty years old and one of the most famous American steamships.



THORNYCROFT ENGINE IN WEST AUSTRALIAN POLICE BOAT.

## ROGERS' BOILER PURIFIER.

Rogers' patent boiler heater, purifier, oil separator and circulating device has met with much success on the lakes for several seasons past. The device will be installed this spring on the complete fleet of the Soo line. It is also being installed on the Western Transit Co.'s steamer Buffalo, the tug Mahoning of New York City, and the Northwestern, trading between New York and Galveston. The Northwestern is an oil burner. The claims for this device are that it heats the feed water, purifies it and separates the oils and greases from it.



ROGERS' BOILER HEATER, PURIFIER AND OIL SEPARATOR.

All water pumped into the boiler with this device is heated to the temperature of the steam, the apparatus being applied to the top of the boiler in the steam and water space. It is then placed over and under a series of plates, under the high temperature, thus separating the foreign matter and causing the solids to drop to the bottom of the purifier, while the light greases, oils and other substances float on top and are retarded or held back by the upper plates. It purifies the feed water by separating the solids and foreign matter, which are blown out by the operator as required, allowing the boiler to run from three to four times as long before cleaning becomes necessary, resulting in saving of labor, power, fuel and maintenance. It separates the oils and greases from the feed water before they are discharged into the boiler, retaining them in the purifier until they are blown out by the operator. The feed water passes through to the extreme end of the purifier and is discharged in Scotch marine boilers in the bottom of the boiler under the furnaces, thus causing a circulation of water below the fire surface and bringing the temperature of the water in the bottom of the boiler up very nearly that of the top, thus preventing pitting and reducing the unequal expansion and contraction which causes leakage, decay and all sorts of steam failures resulting in great expense for repairs and deterioration. The purifier is blown out perfectly empty and clean through a pipe passing into the boiler and along the bottom of the purifier with openings into each partition. This pipe is connected on the outside of the box to the sewer or tank, or in a ship to the sea, and the box is blown perfectly clean every three or six hours, according to water conditions.

Scale is the great enemy in the life and economy of a boiler. The scale acts as an insulator between the heat in the furnace and the water and the boiler, and requires additional consumption of fuel to produce evaporation. It is estimated that scale 11-64 in. in thickness requires two per cent additional fuel, and scale ½ in. in thickness requires 60 per cent additional fuel. It is asserted that this device will positively prevent the formation of scale. Testimonials are submitted by W. E. Lloyd, superintendent of the Mutual Transit Co., Wm. Knight, assistant secretary and treasurer of the Buffalo Dry Dock Co., C. A. McDonald, formerly president of the Ship Owners' Dry Dock Co., of Chicago, M. E. Page, president of the Page Boiler Co., and a great number of engineers on lake steamers.

## ABRAM SMITH.

Abram Smith, whose portrait accompanies this sketch, is one of the many men who have had an important part in building up the lake marine. He is 87 years of age and for half a century and more he has looked after the building of wooden ships at the Algonac ship yard, now operated under the firm name of Abram Smith & Son.

Mr. Smith, who is young at 87, was born in the same port he now lives in. His father, J. K. Smith, who was a veteran of the war of 1812, located on the banks of the St. Clair river in 1815 and four years later Abram was born to him. The Smith home was one of the first at Algonac.

Young Abram was not fed with a silver spoon in his youth. He carried mail from Algonac to St. Clair and back on horseback at the age of 12, and it was not till he reached the age of 14 that his father and two other men became the patrons of Algonac's first school, located in a log house.

It was not till he was about 30 years of age that he started building wooden boats, and it is related that he commanded a schooner, which plied between Algonac and Sandusky, before that. A history of St. Clair county says the ship yard was established in 1856, but Capt. Smith says he was building ships several years before this.

Among some of the boats constructed under his supervision are the following:


ABRAM SMITH, ALGONAC.

Congress, Wolverine, Sultana, Fashion, Wave, Planet, Lexington, Alice Beers, L. M. Mason, Orion, Seabird, R. C. Crawford, James E. Eagle, Princess, Sanilac, J. B. Smith, Emerald, John Ritchie, J. R. Noyes, Jenkins, Oliver, Mary and Belle Mitchell, Albert Miller, Anna Smith, Ella Smith, Delta, J. A. Smith, Rhoda Stewart, J. B. Comstock, Abram Smith, Interlaken, W. K. Moore, A. W. Comstock, and Vinland.

In addition to the above, a dredge and tug were constructed for John Brown, who built the first flats canal.

Many of the Algonac boats are still afloat and in such staunch condition they will outlive, in all probability, the "grand old man" who built them.

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The liner Australian, which went ashore at Vashon Head, North Australia, has been abandoned for a total loss.

## THE MARINE ENGINEER, ENGLISH AND FOREIGN: HIS TRAINING AND EDUCATION.

BY H. BITHEL-JONES.

For many years I have keenly interested myself in the welfare of our marine engineer, more particularly in his practical training, his education, and finally his status. Instead of confining myself to the marine engineer of our mercantile marine, I intend to lay before you the training, education and examination of marine engineers in two or three Continental countries, and to see if they can teach us anything. Terribly insular as we are, yet we are being made to see that it is quite possible that other countries can produce engineers who are quite capable of holding their own with us. We will, therefore, examine the conditions existing in Germany, Denmark, and Norway and Sweden.

I will proceed to show that the training and education of engineers in Denmark is far superior to ours. Each Danish boy who intends to become a marine engineer must serve an apprenticeship in engineering works for not less than four years, during which time, in addition to serving in the fitting and erecting shops, he has to put in a certain amount of time both in the smithy, pattern shops, and molding floor. At the end of his time he is examined, and if his employer is satisfied that the apprentice is thoroughly conversant with his work, he is granted an ability certificate; but in the case of unsatisfactory apprentices, the employer has the power of making them serve an extra three, six, twelve months, or even two years. As a rule two apprentices are allowed for each journeyman fitter, and great care is taken to avoid confining apprentices to any particular class of work in which they may show ability. Each apprentice must be able to fettle his own tools. All apprentices are on the same level, premium apprentices are unknown, all are treated alike—rich and poor. Running concurrently with his practical work is his theoretical training. After his work is over, usually at 5 o'clock, the apprentice has to attend evening classes each night of the week from 6:30 to 9:30. Your particular attention is drawn to this, each night of the week and also on Sunday afternoons, though I may say that at present the apprentices are agitating for a free Sunday, which I trust they will get. What would our apprentices say to such a system? Apart from stated holidays the apprentice is compelled to attend the evening schools, which are under government control with state-paid teachers. The Danish government compels all engineering apprentices to attend evening classes.

During his apprenticeship the apprentice is able to pick up a large amount of theoretical knowledge which enables him to hold his own with the all-powerful British engineer.

He receives preparation in the following subjects, and his advancement depends upon his own natural abilities:

*Mathematics*, embracing geometry, algebra, trigonometry, conic sections, the differential and integral calculus.

*Mechanics*, both theoretical and applied.

*Drawing*, freehand, machine, and hand-sketching.

*Theory of the Steam Engine.*

*Sound, Light and Heat, Magnetism and Electricity.*

*Chemistry*, and the metallurgy of common metals, such as iron, steel, copper, etc.

He also has to undergo a practical training on the construction and working of engines and boilers on board vessels. Towards the end of his time, or at the close, depending upon his ability, the apprentice who intends to enter the mercantile marine as an engineer must pass an examination, success in which will allow him to go to sea as an assistant engineer; repeated failure means that this profession will be closed to him. Having passed this examination, he receives a certificate, Anden Mester, as it is termed; with this he is allowed to go to sea for two years as an assistant engineer, but is not allowed to take charge of a watch until the completion of the two years. During these two years, or generally at the close of the two years, the assistant-engineer is allowed to sit for his Fursten Mester certificate, corresponding to our chief's certificate, but he will not be allowed to use it until he has completed the before-mentioned two years. To pass this examination it is necessary for him to attend a day nautical school for a varying length of time, depending upon his ability. These nautical schools are under government control, with a state-paid staff. Candidates are allowed, in case of failure, to make several attempts, but repeated failure will necessitate him cutting short his career as a marine engineer. This certificate will only allow him to take charge of cargo boats trading in the Baltic and European seas, but for passenger boats and ships trading to non-European ports it is necessary for the engineer to sit a further examination in higher mathematics, electricity, refrigeration, hydraulics and thermodynamics.

The constitution of the examining body for the two examinations is as follows:

(1) An examiner representing the government must be a qualified engineer.

(2) Either one or two of the school instructors.

All marks gained during instruction materially assist each candidate. In addition to a written examination, the candidate has to appear before the above-mentioned examining body, where he is cross-examined by one of the instructors. The government official may or may not cross-examine the candidate.

Having dealt so exhaustively with Denmark I do not propose to go very fully into the systems in vogue in Germany, Norway and Sweden. Turning to Norway and Sweden we find that after serving his apprenticeship the future marine engineer must serve at least 12 months on board a steamship carrying a certificated engineer, he is then allowed to enter a nautical school which is under the direct control of the marine department and subject to government inspection. The nautical school is divided into two divisions: The navigation department and the marine engineers' department.

The former is sub-divided into mates and masters classes, and the latter into engineers and chief engineers classes. Conditions of admittance are imposed, and those which relate more particularly to marine engineers are as follows:

(1) Must have served 12 months at sea and also his apprenticeship.

(2) Must be able to write legibly and take down dictation.

(3) Full knowledge of the first four rules of arithmetic, vulgar and decimal fractions.

(4) Candidates for chief engineer's certificates must hold engineer certificate and have served at least six months at sea.

Previous to the examinations being held, classes are conducted by the respective teachers, and minutes kept which are produced at the examinations. The examinations are held in the presence of the board of directors of the school by the following persons acting as examiners:

(1) The government inspector or a royal naval engineer.

(2) The chairman of the school.

(3) School instructors, who cross-examine each candidate before this board.

SUBJECTS OF EXAMINATION.

*Engineer's Grade.*

A written and *viva voce* examination is held in the following subjects:

(1) Arithmetic.

(2) Practical geometry and mensuration.

(3) Elementary trigonometry.

(4) Theoretical and applied mechanics.

(5) Machine drawing.

(6) Thorough knowledge of the working and handling of marine engines and boilers.

*Chief Engineer's Grade.*

In addition to what is required for engineer's examination:

(1) Arithmetic and algebra.
(2) Strength of materials.
(3) Thermo-dynamics.

In this country we have the state controlling the education and examination of its marine engineers and the actual teachers together with an external examiner conducting the examinations.

We finally pass on to Germany. In Germany four classes of certificates are granted:

(1) 4th class certificates to engineers in charge of tug boats, steam trawlers and coasting cargo boats.

(2) 3rd class certificates to engineers in charge of cargo boats in the North Sea and Baltic and coasting passenger vessels.

(3) 2nd class certificates to engineers trading in ships 12 deg. N. of the equator.

(4) 1st class certificates to engineers on all sea-going vessels in all seas.

Dealing with the 2nd class certificate it is necessary for the candidate to have served three years in a workship and two years at sea. To be admitted for a 1st class certificate it is necessary for the candidate to have served two years at sea with a 2nd class certificate. The examination board consists of a president and two members. One member must either be an engineer in the imperial navy or have been chief engineer in the mercantile marine. The second member must be an instructor in marine engineering at a public nautical school.

*Examination.* — Thorough, practical knowledge is required from candidates for the 4th and 3rd class certificates.

*2nd Class Certificate.*—Thorough knowledge of the German language, and fair knowledge of English. Mathematics, mechanics, physics, steam and machine drawing. Thorough knowledge of the working, repairing, and handling of engines, boilers, and auxiliary machinery.

*1st Class Certificate.*—Advanced knowledge of German and English. Advanced mathematics, mechanics, geometry, conic sections, the calculus, trigonometry, thermo-dynamics, physics, chemistry, machine design, electro-dynamo mechanism. Practical *viva voce* examination.

The same conditions exist in the Dutch mercantile marine.

Having now reviewed the conditions existing in other countries, it now remains for us to pick out features which figure pretty prominently, and they are as follows: (1) System of apprenticeship; (2) Education of apprentices and engineers; (3) High standard of theoretical knowledge demanded; (4) The principles underlying the sciences are taught; (5) State-aided schools; (6) The constitution of the examining bodies.

Keeping these features before us, we will pass on to the British marine engineer, and glance at his training and education. I may seem to take a somewhat pessimistic view, but let me assure you that my desire is to improve, and not to detract from, his status as a marine engineer.

Starting with the system of apprenticeship existing in this country, I feel sure that you will agree with me when I state that we are far from being perfect; our system is incomplete. To-night I wish to deal more particularly with marine engineer apprentices. The system of indenturing is almost extinct, except in the case of premium apprentices. The only guarantee that the majority of employers will give is that as long as the lad behaves himself and attends regularly he will be kept in the works. No promise is given to teach the boy, who may leave whenever he likes, and who may be dismissed whenever the employer thinks fit. This condition of things it to be regretted, for not only is it a most unbusinesslike arrangement, but it is also a very harmful and dangerous one, for our firms are turning out, year by year, a large number of unskilled mechanics, who during their apprenticeship have developed habits of laziness, and barely know the mere elements of their work. They are not examined or tested either during their apprenticeship or at the close, with the result that joining a trade union society they are able to leave the workshop where they were supposed to be trained, and obtain employment elsewhere as improvers or journeymen.

Other apprentices, having shown considerable ability in one particular class of work, are frequently kept at this work during the greater part, if not the whole, of their apprenticeship. For instance, a boy spending his time at a lathe, will, on completion of his time, perhaps want to go to sea. What happens? An absolute useless article is dumped down upon the poor chief and second engineer; he hardly knows the boiler from the engine, is quite incapable of repairing his own tools —like chisels. He struggles on, but at what a cost! Each boy who is going to be an engineer should be bound to his employer, who will guarantee to see that the boy receives a thoroughly practical training in pattern-making, smithy work, knowledge of molding, fitting and erecting of boilers and engines.

Many firms are making praiseworthy efforts to better the conditions of the apprentices, but little or no success can ever be expected until the two government boards—the board of trade and the board of education—decide to co-ordinate with the employers, and between them draw out a scheme for the training and education of marine engineers.

I believe you will all agree with me when I state that five years is not any too long a period for a boy to serve an apprenticeship in the shops. The wide knowledge required by a marine engineer in the working and repairing of the huge and complicated masses of machinery to be found on modern vessels makes it essential for the marine engineer to be familiar not only with his fitting implements—the hammer, chisel, file, etc.—but that he should also know something about pattern-making, iron and brass molding, boiler-making and smithing. Of course, it does not follow that our engineer is to be a proficient pattern-maker, molder or blacksmith.

All apprentices should be on the same level, no distinction should be made between the rich and poor apprentice. Premium apprentices are regarded with disfavor both by employer and employee. Let the advancement of the apprentice depend on his own exertions and natural ability, and if he fails to attain a certain standard at end of each year of his apprenticeship, let the employer cancel the agreement; irregularity, idleness and indifference would then receive the punishment it deserves. In the long run employers would turn out a very different class of apprentices to what is being put on the market at present. During his apprenticeship the employer should see that the apprentice's theoretical training is not neglected. The Education Acts of the last few years make provision for coordination between the employer and the education authorities. Each district or municipality should have definite schemes of progressive instruction drafted to meet the local requirements.

Many and varied are the systems that have been adopted in this country by large engineering firms for the education of apprentices: (1) There is what is termed the sandwich system, by which the apprentice at the end of two years' apprenticeship is allowed to attend a day technical college during the six winter months and return to the works during the summer months. This is usually carried out during the last two or three years of the apprenticeship. (2) Then there is what is termed the whole day system, by which firms allow their apprentices to attend a day technical school one whole day each week, this supplemented with evening classes has proved a great success. (3) Some firms allow their apprentices to proceed to college after serving three or four years. (4) Some firms have an arrangement by which their apprentices attend school mornings from 6:30 to 8:30, on two or three mornings each week.

In this district I have found several firms who encourage their apprentices to attend evening classes by offering them certain inducements, *e. g.*, paying their class fees, promotion in the works, increase in weekly pocket money. Speak-

ing of this district we have to face one serious difficulty, and a difficulty that cannot be dealt with lightly, and that is the question of apprentices working overtime. As you are aware, it is absolutely necessary for employers engaged in repairing work to call upon their apprentices to work any night they are required. Shipowners, like the tide, can wait for no man; it is essential that the repairs should be effected with as little delay as possible. The only way I can see out of the difficulty is to duplicate the evening classes so that if an apprentice is engaged one night he may attend the same class on another night.

Before finishing with the apprentice question I should like to lay before you my ideas as to the subjects that marine engineer apprentices should cover during their five years' apprenticeship. First and foremost comes mathematics; without mathematics the engineer will never get very far; the proper study of mathematics teaches the student to reason and to think out problems for himself. Men holding some of the foremost positions in the world to-day are there due to the sound training they received in mathematics. Each apprentice should work steadily through a course in algebra, trigonometry, geometry, geometrical conics, and not give up until he can handle the differential and integral calculus just as he can handle his hammer and chisel. He should also receive a thorough grounding in kinematics, kinetics, statics and hydrostatics. He will then be prepared to take up machine drawing and design, the steam engine and thermo-dynamics, hydraulics, mechanism of machines, strength of materials, metallurgy of iron, steel, and principal alloys. A sound training in general physics and elementary chemistry will prove of immense benefit to the apprentice, and finally magnetism and electricity, finishing up with electrical engineering. The above list may appear formidable, but steady application from the commencement of apprenticeship will enable the average lad to receive a sound grounding which will probably induce him to extend his studies on the completion of his time. Two nights a week for five years will cover a great deal of ground.

Now I come to the point which I believe this association has striven for many years to obtain, and that is the examination of engineers who wish to go to sea. I have one fault to find with you, and it is this: You do not go far enough. Why not go to the Board of Trade and demand a better system of examination, different grades of certificates, recognition of apprentices and their training and education, the education of your engineers? What I ask you is probably a great deal more than you have asked for. This association should not rest contented with so small a concession as a third engineer certificate. You should demand a complete revision of the system, and that your engineers and apprentices be brought more into line with other countries.

To my way of thinking, what we require is as follows: The board of trade should grant two certificates to apprentices out of their time and who have passed the necessary employer's test—(1) Coastal certificate; (2) Engineer's certificate. The first certificate should be granted to those who wish to go to sea on coasting cargo boats, and should be more practical than theoretical. The engineer's certificate should be granted to those who can pass the necessary examination, and wish to join foreign-going shops as junior engineers. No engineer should be allowed to join a ship until he possesses one of these certificates.

The examination for the engineer's certificate should comprise: Mathematics (algebra, mensuration and trigonometry), machine drawing, steam, applied mechanics, elementary physics, chemistry, electricity, and certain general knowledge of machinery on board ship. Apprentices holding certificates in these subjects granted by the board of education should be excused the theoretical part of the examination, but have to be examined in the practical part. After two years' experience the engineer should again be examined thoroughly in his practical knowledge, and success at this stage would enable him to qualify for cargo boats. To qualify for chief engineer of a passenger boat he should be able to pass a stiff examination in higher mathematics, thermo-dynamics, electrical engineering, hydraulics, and applied mechanics. The examinations should be conducted by the board of trade, but the examining board should consist of two or three members: (1) The president should be a government official, surveyor, or naval engineer; (2) one member should be a practical chief engineer, actually in service; (3) another member or members should be one or more instructors from public nautical schools, who should cross-examine the candidate before the board of examiners. The fairness of this examination will no doubt appeal to most of you.

Now, I should like to say a few words about the board of trade and the marine engineer. Up to the year 1862 the position of the marine engineer on board a ship was similar to that of a carpenter or boatswain. In that year the board of trade decided that in future all engineers should prove their ability by examination. Two certificates were granted, the first for those who had served a full apprenticeship and one year at sea; and the second certificate for those who had served one year at sea whilst in possession of the first certificate. But it was not until the Consolidated Shipping Act of 1894 that their position as officers was recognized. The questions set for examination have certainly been altered from time to time, but the standard now is no higher than it was in 1862. During the past 50 years, steam, as the propelling power in ships, has steadily increased, and the calling of a marine engineer has increased in proportional importance. Our first engineers were many of them illiterate men, many had served no apprenticeship and were raised from the shovel, good practical men, and probably capable of managing the slow-moving engines of those days.

The examinations instituted in 1862 have failed to become an efficient educative force. With this view some of you will not agree, but point out that the present-day marine engineer is much better educated than the marine engineer of 50 years ago; this may be, but when you remember the immense strides education has made in all grades of our community, it is very doubtful indeed if our marine engineer has made any marked progress. Clever, educated marine engineers existed in those days, but they were few and far between, and I am afraid that this low standard is only too evident amongst our present-day engineers.

Who is to blame, the engineering apprentice, the employer in whose works he is trained, the ship owners in whose ships he sails, or the board of trade who conducts his examinations?

The appearance? No! A thousand times no, for if any of you would pay a visit some evening to classes held at the marine school for apprentices, or at Jarrow, Wallsend, and other districts, you would feel drawn towards the lads who voluntarily come forward to educate themselves; they come voluntarily, for they know that they must try to gain a little theoretical knowledge. How little encouragement they receive! The corporation or some educational body provide the classes, find the teachers, and then think they have done their duty. No one to advise them, the lads take what subject or subjects they think they should, follow no definite system of study, with the result that times without number they find the subject they have taken too difficult; they get discouraged, and discontinue the classes. Who cares? The employer is indifferent, the government ignore them, their parents find that engineers can get their certificates after going to sea, so they also are indifferent. And yet in spite of all these difficulties we find our lads trying to gain knowledge. No, do not blame

the apprentices; they are ready, only too ready, to take advantage of the meager facilities offered to them.

I have expressed my opinion earlier on about the responsibility of employers. We can hardly expect the onus to be thrown on the ship owner, for he has to take the material provided for him. The greater part of the blame, I am afraid, must be thrown upon the board of trade. They have much to answer for. They have instituted a certain standard of examination, but throw the burden of education upon the marine engineer. The board of trade have not established any nautical schools open to all who want instruction, and will probably tell you, if you were to ask them, that it is not their business to educate engineers for ship owners. They ignore the existence of all schools that are endeavoring to make the best of a very sad state of affairs.

Such is the plight of the marine engineer today. What happens? The ordinary apprentice, finding that theoretical education is not necessary, throws to one side all his books—*i. e.*, if he ever bought any—gets through his apprenticeship, proceeds to sea for the necessary 12 months, and then makes his way to the nearest "crammer" to be carefully stuffed with all the necessary tricks, formulae and data which will enable him to obtain his second engineer's certificate. Who can help him? The government can do so by enforcing compulsory attendance at evening school or day technical schools. Compelling him to pass an examination, in principle and not in rote, before he is allowed to proceed to sea, and, after a certain sea-service, allow him to return for further education to state-provided schools.

Compare the examinations of the board of trade for engineers to the examinations held by the board of education in elementary mathematics, steam, applied mechanics, etc. The board of education examinations consist of scientific principles of the fundamental basis of engineering; the board of trade asks for problems to be solved by fixed data and formulae. The board of trade require their work to be learnt parrot-like by rote, a system consisting of certain formulae and data being crammed hastily, which soon passes from the memory and necessitates the candidates to be recrammed for the next examination, and after the final examination all this so-called education departs forever from the memory of the successful candidate. On the other hand, the board of education demand knowledge of first principles of scientific reasoning of these rules and formulae, thus stimulating the intelligence and widening the knowledge of each candidate, which will allow him to enter upon wider or more advanced fields in his profession.

The difference is no doubt due to the fact that one examination is set by scientific men for scientific and thinking students whilst the other is an examination of empirical data for rule-of-thumb engineers set bv rule-of-thumb engineers, a system which will ever prevent our marine engineers becoming scholars. I believe that our marine engineers are the most capable in the world, but such scientific training and professional ability as they possess has been obtained at *their own cost,* and by sheer determination in the face of hardship and discouragement that would have disheartened any other race of men.

Pressure must be brought to bear upon those in authority to alter the present conditions of apprenticeship and examination, and we will soon find that our marine engineers will show an intelligent comprehension of the scientific principles underlying their profession and will learn to apply those principles.

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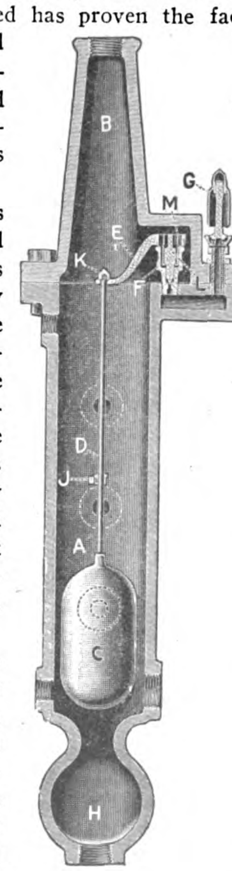
## A RELIABLE SAFETY WATER COLUMN.

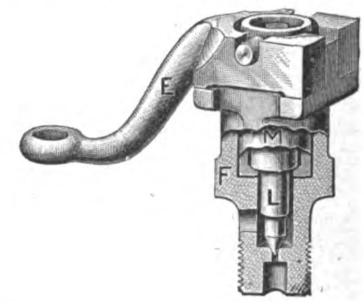
The extended use and unfailing dependability of the Safety water column herewith illustrated has proven the fact that it can at all times be positively relied upon and there is no question as to its practicability.




The column is so constructed that an alarm is automatically sounded when the water in the boiler approaches the low or high danger limit. The manufacturers claim that they have never had a complaint against the positive action of the column in this respect.

It not only safeguards the boiler and its attendants, but from actual tests has demonstrated the fact that a substantial economy in fuel is effected by its use. This is accomplished by carrying the water in the boiler at the lowest constant level consistent with absolute safety, which increases the steam space in the boiler, produces more steam, hence steadier power, and decreases the consumption of fuel.

Steady water carried at the proper level lengthens the life of a boiler, and consequently decreases the amount of repairs necessary. The manufacturers




claim that this improved safety water column will pay for itself many times over in the saving of repair bills alone.

The columns have gage-cock holes tapped on both sides, consequently they can be used as either right or left hand patterns by transposing the plugs and cocks.

If repairs are necessary, the cap B only need be removed, when all working parts will be exposed and are easily accessible. It is not necessary to take down the entire column, or even to remove the water gage or gage cocks.

But one strong seamless copper float is used and owing to its form and size, it never fails to operate the signal valve upon the approach of the low or high danger limit. The floats are carefully tested, and will not collapse under 350 lbs. pressure.

The sediment chamber H is a very valuable adjunct to the column, inasmuch as it collects the dirt, scale, etc., that would otherwise enter the water gage fittings and gage cocks. A drain can be provided in the bottom of the chamber to discharge the collected sediment.

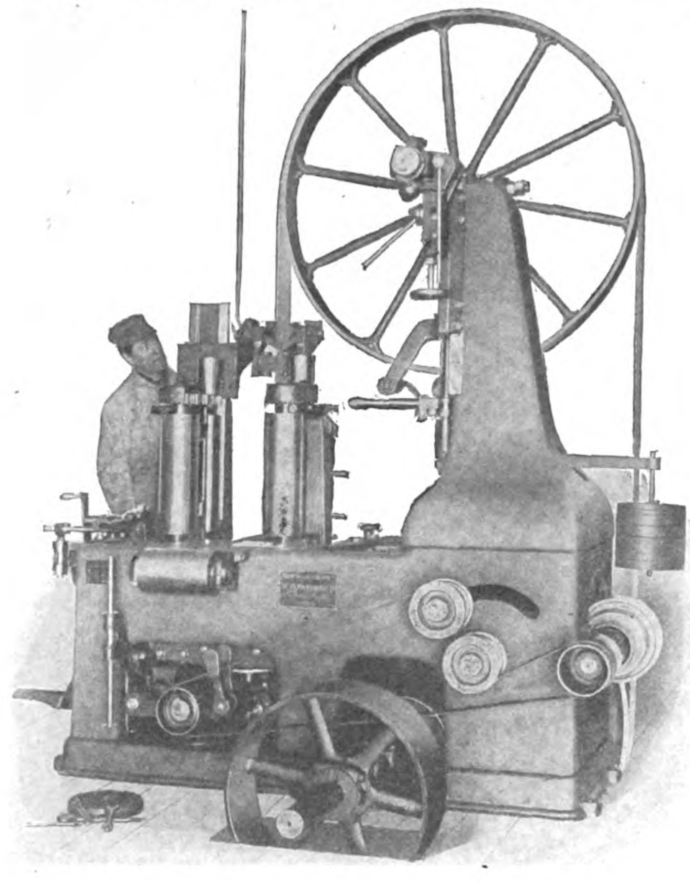
The operation of this improved Safety water column is as follows: The float C has rigidly attached thereto the rod D, which operates through a hole in the valve lever E. The stop J, which can be placed in any desired position on the rod D, strikes the valve lever E, should the water in the boiler become too high. Referring to the detail illustration it will be seen that as the valve lever E is raised it lifts the valve L from its seat, allowing the steam from the connection at the top of the cap to pass through the seat opening and thence to the whistle. The same result is accomplished when the water becomes too low in the boiler. When the float falls, the knob K, on the rod D, forces the valve E down, which also opens the valve, allowing steam to reach the whistle.

The columns are made in various sizes suitable for the different types of boilers.

The Lunkenheimer Co. of Cincinnati, O., are the sole manufacturers of this improved device, which they have given the trade name of "Vigilant."

## STANDARD BAND RESAW.

Wm. B. Mershon & Co., Saginaw, Mich., have just put out a catalog, illustrated with actual photographs (not half-tone reproductions, but photographs directly printed from the negative) describing their new Standard 54-in. band resaw. This machine weighs 7,500 lbs. The wheels are 54 in. diameter, carrying 6-in. saw blades. The floor space is 6 ft. 9 in. wide by 4 ft.



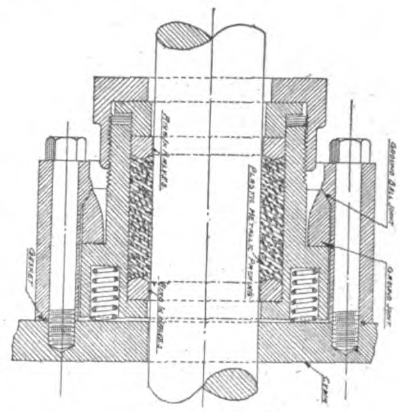
STANDARD 54-IN. BAND RESAW.

10 in. deep, and the height of the machine is 9 ft. 6 in. The driving pulley is 24 in. by 8½ ft. The machine should run 575 revolutions per minute, and in kiln dried hard wood 525 revolutions per minute.

No description in words could possibly equal the description conveyed by the photographs, as they show the machine in front view, as seen from its working side, the compact grouping of the saw blade, feed rolls and special supports and all the material used in the construction of the device. The relation of the saw and the feed-works is such that this resaw operates on a principle different from all others. In sawing crooked lumber, it saws in a line like a skillful workman operating by hand. The wooden faced "pressure feet" support the thinnest material without danger of injury to the saw blade. There is no possibility of the saw coming in contact with iron, as wood and not metal supports the stock. One of the photographs gives an idea of the feed works as a whole. The cradle casting supporting them is so placed that it brings the delivering feed rolls as close to the saw as is possible for straight resawing. The cradle automatically withdraws to permit the tilting of the feed rolls for bevel sawing without coming into contact with the blade. Anyone interested in this machine would do well to write for this catalog.

## VIBRATING STUFFING BOX.

The accompanying line drawing shows the vibrating stuffing box recently completed by the Steel Mill Packing Co., 40 to 44 West Larned street, Detroit. Mich. This stuffing box automatically adjusts itself to any out-of-line movement of the piston rod or stem. It will be observed that the stuffing box is arranged within a casing and is held against the ground ball joint ring by means of springs, assisted by the steam pressure from the cylinder, keeping the joints tight and preventing leakage. A clearance is provided between the stuffing box and interior of the casing and between the rear surface of the stuffing box and cylinder head. This permits the stuffing box to move laterally relative to the casing to compensate for the



out-of-line movement of the rod or stem and to rock on the curved face or ball joint to adapt itself to any angular movement of the rod. The spacing rings at each end of the packing work in connection with the packing, holding the stuffing box out of contact with the moving parts, thus preventing wear.

On Dec. 1 last the company placed one of these stuffing boxes on the main piston rod of an 100 H. P. engine in the Butterfield power building at Detroit. When the stuffing box was applied to this engine the piston rod was placed out of line so as to have an angular as well as lateral movement of more than one-sixteenth of an inch, and it has been found that the stuffing box "floats with the rod" without any resistance, performing perfect work. In this instance the stuffing box is packed with Safety plastic metallic packing, although it should be said that any suitable packing can be used. Since the stuffing box has been placed in operation it has been examined by many mechanical experts who have expressed much interest in its operation and have pronounced it a most practical and economical device. The company is now equipping its factory with machinery for manufacturing these vibrating stuffing boxes and it will soon be prepared to place them on the market.

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The ship yard of Mackie & Thomson on the Clyde is likely to be abandoned, together with others of its kind within the harbor at Glasgow, in order to make room for much-needed harbor expansion. It is likely that the firm will take up new quarters at Irvine.

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The Seamen's Church Institute of New York has issued its sixty-second annual report of its work among seafaring men at that port.

## HAWSE PIPE COVER AND ANCHOR CLAMP.

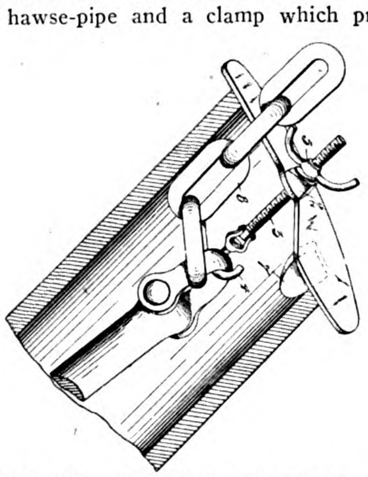
Capt. William J. Tomlin, of Marine City, who sails the steamer William E. Reis, has invented an extremely simple appliance for the hawse pipes on lake freighters. He used two of them on his

CAPT. WM. J. TOMLIN, OF MARINE CITY.

own boat last fall with success and he is now figuring on putting them on all the freighters.

Capt. Tomlin's invention is known as a "Hawse pipe cover and anchor clamp." The illustration shows how it works. By its use, there will be no such thing as boats filling up in the fore-peak and going down by the head in a big sea.

"The object of the appliance," explains the inventor, "is a combined cover for the hawse-pipe and a clamp which pro-



HAWSE PIPE COVER AND ANCHOR CLAMP.

jects through the cover, engages the shackle of the anchor, and is drawn tight, drawing the anchor stock tight against the hawse-pipe and at the same time securing the cover tightly against the hawse-pipe on the inside of the vessel, closing the opening entirely and holding the anchor tightly, so it cannot pound and injure the vessel and, at the same time, by a holding clamp, that is easily and readily loosened."

The inventor claims that his appliance will do away with all pounding in a sea, by holding the flukes of the anchor up snug against the boat's side. Generally, there is always a little slack when the anchor is hauled in with the windlass. All captains know this, and before going out in heavy weather they attempt to remedy it. As has happened, it has been next to impossible to cover the hawse-pipes so the seas won't wash up through.

The clamp has a hook attached to it by a swivel and it extends up through the plate in a 2-in. hole, its own diameter being an inch and a half. There is a flat steel thread on the bolt, obviating any chance of its being out of whack when needed. The winged nut used for tightening can be made taut by hand. The cover with the possible addition of a handful of rope yarn makes it water-tight.

Capt. Tomlin has been a master for thirteen years, starting as a boy on the old schooners. He has been master of the A. A. Turner, Selina, Unique, Schoolcraft, Toltec, Tampa and Wm. E. Reis. He sailed the Unique when she was racing almost daily between Detroit and Port Huron with the City of Toledo, commanded by the late Capt. Geo. King. Sometimes the Unique beat and sometimes the Toledo did. Capt. Tomlin says this was the stiffest job he ever had.

## BLOWERS FOR BURNING FUEL OIL.

The Wilbraham-Green Blower Co., Philadelphia, has just received from a Japanese ship building company an order for sixteen large Green blowers, each driven by a vertical engine on the same bedplate, for burning fuel oil under the boilers of two 16,000-ton steamers. These vessels have about 13,000 H. P. each and are driven by turbine engines. The same company has also furnished a number of blowers for burning fuel oil on steamers of the American-Hawaiian Steamship Co., the Standard Oil Co., and other lines operating on the Atlantic and Pacific coasts.

## INTERNATIONAL WATERWAYS COMMISSION.

A meeting of the American section of the International Waterways Commission was held at the Federal building in Buffalo Saturday, March 2, for the purpose of giving a hearing to manufacturers located along the Erie canal and its feeders between Medina, N. Y., and the Niagara river. Under the provisions of the Burton act it is provided that manufacturers may use 400 cu. ft. per second of the surplus water not needed in preserving the lake levels. It was disclosed at this meeting that 500 cu. ft. is now being used and the consumers urged that they be allowed to take an additional 1,000 ft. The commission informed those at the hearing that this was beyond their power, but that they would recommend to the secretary of war that the manufacturers in the district referred to be permitted to continue using 500 ft. per second, which is equivalent to an increase of 100 ft., the original allowance made by the secretary of war being 400 ft. during the life of the Burton act. The commission will adopt a special form of permit to be used in dealing with the manufacturers who are interested in Erie canal water for power purposes west of Medina, N. Y.

The secretary of the commission is now engaged in gathering and arranging data bearing on the lake levels and studying data which has been collected in the previous past forty years. When this is in tangible form a meeting of the International Waterways Commission will be held to revive the discussion with regard to raising the lake levels. The point foremost in the minds of the commission in this connection is that of the plan which has been suggested in the proposed damming of the Niagara river either at the foot of Lake Erie or at some point along the Niagara river. General O. H. Ernst, chairman, of Washington, D. C., George Clinton, of Buffalo, and Prof. E. E. Haskell, of Ithaca, were present.

## TRADE PUBLICATIONS.

The Hon. John A. Walker, vice president and general manager of the Joseph Dixon Crucible Co., Jersey City, N. J., recently delivered a speech before the Boost Club, at New York, outlining the history of the lead pencil. The various stages of invention and manufacture were most interestingly described, ranging from the first pencils made in America by a school girl from hollow alder twigs and graphite paste down to the present magnificent industry at Jersey City. The speech in booklet form has been published by the Joseph Dixon Crucible Co.

A pamphlet describing the Smith Continuous Water Softener has been issued by Robert C. Smith & Co., 929 Monadnock Block, Chicago. Its important features are well brought out and large illustrations supplement the descriptions.

The Marine Iron Works of Chicago, builders of marine machinery of many types, have issued catalog No. 17. The catalog is very attractive, being concise in its statements and finely illustrated.

## AUTOMATIC SAFETY LIFE BOAT HANDLER.

The Irvine Life Boat Handler Co., which was recently incorporated under the laws of New York, has been granted an exclusive license by the Marine Safety Appliance Co., to use, manufacture and sell the automatic safety life boat handler. On account of lack of capital, the old company found itself unable to properly handle the business. Hereafter, all orders will be filled by the Irvine company.

This is the invention which Capt. Frank W. Irvine, late of the Ward Line, has spent ten years in perfecting. It is a mechanical device for swinging out and lowering life boats on board vessels—an invention, which in case of fire, sinking of vessel, or other disaster at sea, or in case of a man overboard, is a quick and sure means of saving life.

No invention in recent years, along the line of marine devices, is of such great value in adding to the safety and protection of lives on vessels as this life boat handler. It enables every steamship captain and every steamship owner to carry, with less anxiety, the responsibility he assumes in the transportation of crew and passengers.

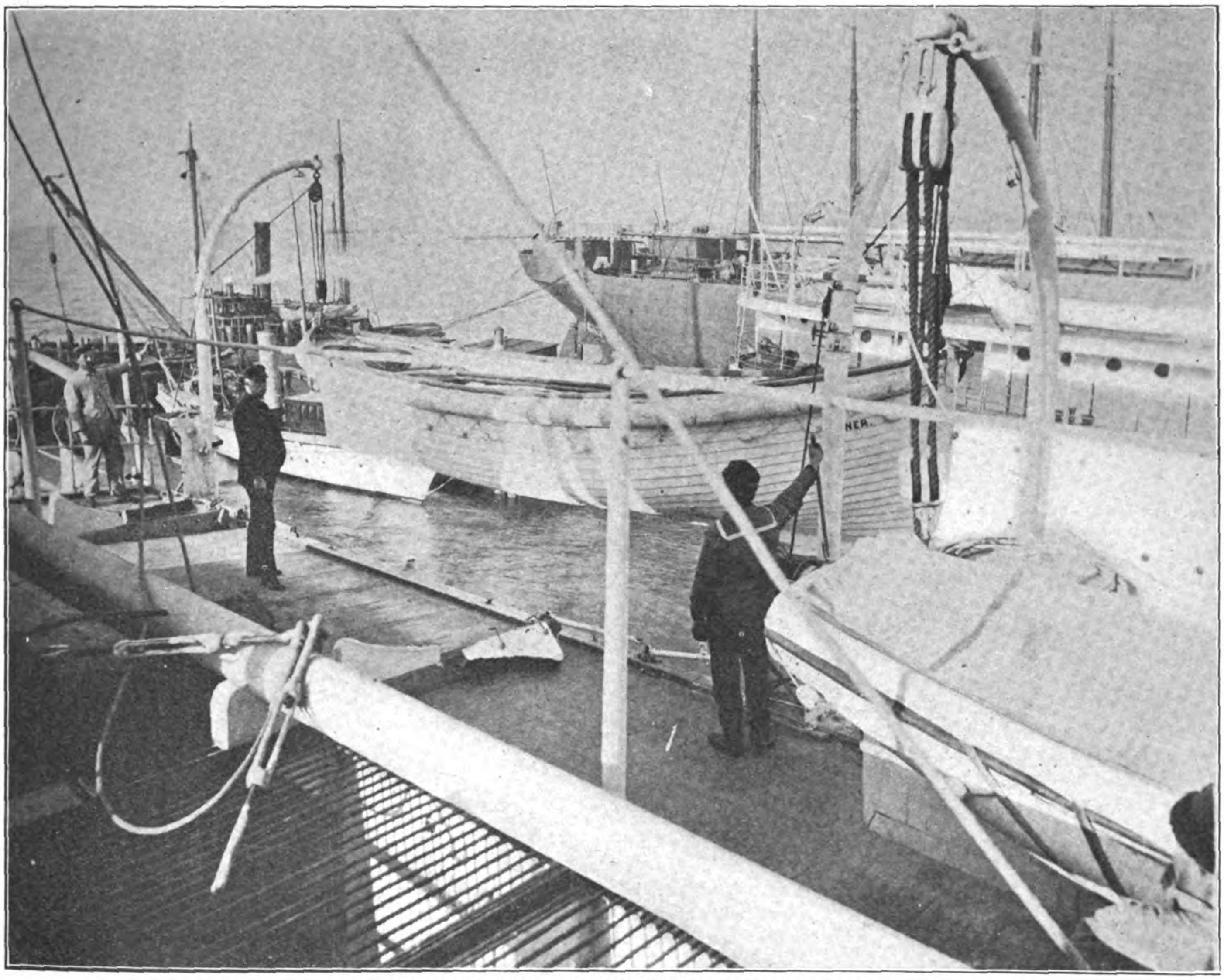
Many disasters of late years have proved the unreliability of the present way of handling life boats. In the Elbe disaster only two boats were lowered. The Bourgogne could lower only four boats and the Narconic is believed to have been unable to lower any at all, as none of her boats have ever been seen or heard of.

Although there is a law requiring all steamers in the passenger trade to have a boat drill at least once a week, which law includes the lowering of life boats, it is a well known fact that commanders find it impracticable to have the work done, as they have not sufficient crew for the full work of hoisting, swinging out and lowering-away of life boats.

With the automatic safety life boat handler there can be no excuse for the neglect of this drill. It requires so few men and so short a time to have the drill that no captain would omit it.

Years of experience demonstrate the fact that there is no part of a ship's equipment more important than a reliable device with which her boats can be lowered and detached in time of emergency. Although a vessel may run for years without having occasion to lower a boat to rescue her own passengers or crew, she may have often run across others in distress, and by being able to send a boat to them, would perform a duty that would redound to the credit of her crew and management.

It is a noticeable fact that, although many and important improvements have been made in the construction of vessels and steamships and their equipment during recent years, the facilities for handling life boats, so important in saving lives, has not im-



LOWERING AWAY (THIRTY SECONDS AFTER SIGNAL.)

proved any during the last century.

The hoisting, swinging out and lowering-away of life boats by the automatic safety life boat handler can be done in a half to one minute in all kinds of weather by only two men. The old method of doing this work requires twelve men from seven to ten minutes. Guys are not needed.

This invention is a gear worked by hand. When life boats are most needed as a rule electricity or steam cannot be depended upon. The gears can be attached to any davit now in use; one is situated at the bow and the other at the stern of the life boat on deck. After the boat is hoisted, the davits swing out automatically—no pulling or pushing being required—and the lowering away of the boat is entirely in the safe control of the two men in charge of the gears.

In the running overboard of life boats by this new method, confusion and delay are avoided, and the crew have ample time for careful inspection of the boats and the care of the passengers. The two men necessary to handle the gears need not be sailors; in an emergency, firemen, waiters or passengers may, with equal facility and no experience whatever, raise or lower the boats with a minimum of effort.

The two machines required for each life boat occupy a deck space beside each davit in the No. 1 size of 12 x 12 inches; in the No. 2 size, 14 x 18 in. The only additional deck space used in handling the boats is that required for a man at each machine who works the machine and the falls.

Wire rope is used for the falls and is a further protection against fire. In cold weather ropes are generally frozen and often full of kinks and turns, which greatly handicap the work of lowering the boat. Wire will last much longer and will in the course of time save the cost of the gear as it is necessary to renew rope at least once a year.

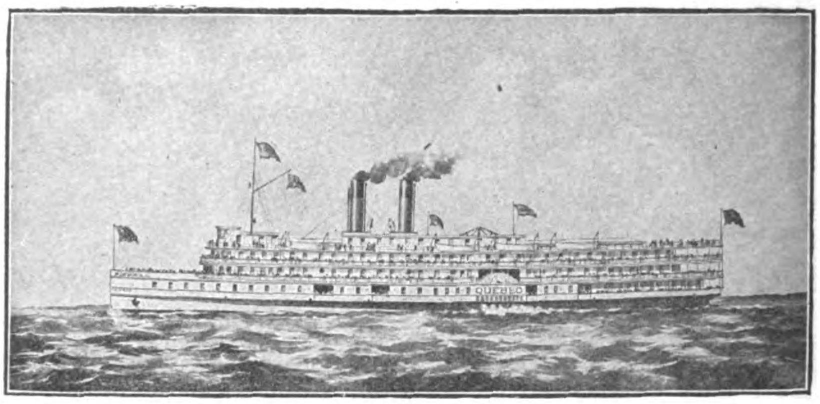
The automatic safety life boat handler was approved by the board of supervising inspectors of steam vessels last May. It is already in use on the government transport Sumner and the harbor boat General Meigs. Several commercial lines have also adopted it, notably the Fall River line and the Detroit & Cleveland and Goodrich lines on the great lakes.

It is made in sets, one machine for each davit, and comes in two sizes. No. 1, for ferryboats, yachts, tugs, and the smaller and medium size craft. No. 2 for steamships and large vessels carrying heavy boats, steam launches, life rafts, etc.

The Irvine Life Boat Handler Co., 24-26 Stone street, New York, has published a handsome catalog descriptive of the devices and orders are now being taken subject to thirty days time in filling them.

## NEW STEAMER QUEBEC.

The new steamer Quebec, illustrated herewith, is being built at Sorel for the Richelieu & Ontario Navigation Co. for the Montreal-Quebec service, and will be completed for the season of 1907. The vessel is 311 ft. in length over all, 35 ft. beam of hull, 63 ft. beam over guards, and 12 ft. molded depth. She will have beam jet condensing engines of 1,500 I. H. P. and four boilers of the returning tubular type.



NEW STEAMER QUEBEC.

The Quebec will have excellent accommodations, including 210 staterooms, 16 parlors and eight baths, with running water in each room.

On the main deck is a large tiled entrance, finished in mahogany and elaborately decorated with panels painted in oils, depicting scenes on the historic route of the Richelieu & Ontario Navigation Co. Opening off this entrance hall is the cafe and the large Flemish dining room, seating 150 people. The dining room will have large observation windows, and on the decorated panels will appear the crests of the different provinces of the Dominion of Canada. The pantry and kitchen arrangements are most modern.

The grand staircase leads from the entrance hall to the saloon deck. The decorations in saloons will be similar to those of the sister ship, the steamer Montreal, the general color scheme being in delicate greens. The carpets will be English Wiltons, specially designed.

A feature of this boat is an observation, lounging and smoking room on the hurricane deck.

Orton J. McGaw, who was mate on the steamer Australia last season, is going on the steamer J. T. Hutchinson in the same capacity this year.

## NEW TYPE OF COALING SHIP.

There has recently been conducted at Devonport dock yard a series of experiments with a new type of lighter providing means for filling bags with coal on board the lighter without any recourse to shoveling, and the automatic transportation of the bags to the ship's bunkers. Seven vessels of varying types were coaled, the quantity taken on board ranging from 1,000 tons to 172 tons. In the first case the trial extended over six hours, during which time 609 tons were placed on board, the remaining 391 tons being taken on after the trial. The highest coaling speed was attained in shipping 705 tons on board the Isis, when 41.75 tons an hour were placed on board from each transporter. In the final trial, in coaling the Victorious with 720 tons, the task was accomplished in 5 hours and 40 minutes actual working time.

## THEY OUGHT TO KNOW.

Mr. Charles E. Hyde, of the New London Marine Iron Works, formerly of the Bath Iron Works, installed a Roberts boiler in his yatch Never Again. Mr. Lewis Nixon built the steam house-boat Loudoun and installed a Roberts boiler. Mr. E. P. Morse, of the Morse Dry Dock & Repair Co., South Brooklyn, N. Y., installed a Roberts boiler in his yacht Why Not. Mr. C. B. Orcutt, of the Newport News Ship Building & Dry Dock Co., has used Roberts boilers in his steam yachts for nearly fifteen years. Mr. Nourse, of the Marine Iron Works of Chicago, does likewise. It would seem as though this list of ship builders ought to know.

The Electric Boat Co., of Quincy, Mass., has purchased the steam yacht Starling from the estate of W. L. Lockhart, of Boston. The Starling is 121 ft. over all. She is now having a No. 16 Roberts Safety water tube boiler installed and will be used as a tender to the Holland submarine boats in their government trials, which will take place in March.